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Prepared by Clete Daily and Associates for the City of Bozeman in cooperation with the Montana Department of Highways and the Federal Highway Administration, Department of Transportation.

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BOZEMAN TRANSPORTATION STUDY

1981

PREPARED FOR
THE CITY OF BOZEMAN

IN COOPERATION WITH THE MONTANA DEPARTMENT OF HIGHWAYS AND THE
DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

PREPARED BY

CLETE DAILY AND ASSOCIATES
HELENA, MONTANA

JANUARY - 1982

The opinions, findings and conclusions expressed in this publication are those of the authors and not necessarily those of the Federal Highway Administration or the Montana Department of Highways.

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DON M. HARRIOTT, Administrator, Engineering Division
JAMES W. HAHN, Chief, Planning and Research Bureau
KEENAN BINGHAM, Supervisor, Urban Planning Section
JOHN W. LEWIS, Transportation Planner

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Federal Highway Administration

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ARTHUR VAN'T HUL, City Engineer, City of Bozeman
JOHN M. EVANS, City Manager, City of Bozeman
JOHN H. MOSS, Director, City-County Planning Board, Bozeman
EARL R. BEST, County Engineer, Gallatin County
DICK McCONNEN, Citizen Representative, Bozeman
DON DeGRAFTENREID, Transportation Planner, FHWA
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CHAPTER I.

INTRODUCTION

A. HISTORY OF PLANNING IN BOZEMAN

The following is a brief, general chronological history of transportation planning which has taken place in the Bozeman area over the past 20 years:

1958 - A city "Master Plan" was prepared consisting primarily of a street plan.

1960 - A consultant reviewed the Major Streets Plan and made recommendations for a county zoning resolution, revision of the subdivision ordinance and establishment of procedures for subdivision review.

1967 - A series of planning studies was conducted by Consulting Services Corporation and Theodore J. Wirth and Associates.

The "Arterial Streets Plan" was updated, a zoning map for the jurisdictional area outside the Bozeman City limits was prepared, and a Capital Improvements Program was prepared.

1971 - A traffic and parking study was conducted for Montana State University by Clete Daily and Associates. The study recommended improvements to the campus parking and traffic circulation system.

1972 - A comprehensive Plan was completed and adopted by the governing bodies for the Bozeman jurisdictional area.

1973 - A study of the Bozeman Central Business District was conducted by C.T.A. Architects/Engineers and Planners. The Study made recommendations for traffic circulation and parking along with a central area development plan.

A TOPICS (Traffic Operations Program to Increase Capacity and Safety) study was prepared by Menasco-McGuinn Associates. The study recommended minor operational improvements to the street network identified as the TOPICS system.

1974 - The Mayor's Advisory Committee on a Bicycle Pathway System for Bozeman submitted a report to the City Commission recommending a bikeway system and implementation methods.

1976 - A Parking Commission was formed. The commission converted the on-street metered parking to free parking, and constructed 200 offstreet parking spaces financed through a Special Improvement District (SID).

The Bozeman Pedestrian Safety Committee was formed for the purpose of evaluating pedestrian facilities and safety in the Bozeman area.

1977 - Citizens Advisory Committees were formed to develop recommendations for the updating of the Bozeman Area Master Plan. As part of this effort, a Transportation/Circulation Committee was formed to formulate goals and objectives for the Area Transportation Plan.

At the request of local government, the Montana Department of Highways initiated a comprehensive transportation study for the Bozeman urban area. A Technical Advisory Committee was formed to evaluate the study findings as it progressed, and a Policy Coordinating Committee was established to review and establish final improvement priorities.

1981 - A Bikeway Plan for the Bozeman area was developed for the Department of Natural Resources and Conservation by Clete Daily and Associates. The Plan is in the form of a bikeway map which shows the routes and recommended improvements, such as signing, striping or constructing exclusive bikeways.

B. SCOPE OF THE BOZEMAN TRANSPORTATION PLAN

1. Transportation Planning Process:

A brief overview of the process used by the Federal Highway Administration of the Department of Transportation and the Montana Department of Highways to develop transportation plans for Montana communities is as follows:

a. Establish a Technical Advisory Committee (TAC), to review and guide the development of the transportation plan, and to recommend improvements.

b. Establish a Policy Coordinating Commission (PCC), made up of local, state and federal officials. This committee reviews the recommendations of TAC, sets improvement priorities and coordinates the implementation of improvement projects.

c. Conduct the necessary studies to develop a comprehensive transportation plan for the urban area. The plan will:

   1) Identify existing and future transportation problems.

   2) Recommend major and minor improvements required to meet future transportation needs.

3) Take into consideration local concerns and ideas relating to the transportation system. This will be accomplished by conducting public meetings to present the findings and recommendations contained in the Bozeman Transportation Plan.

2. Goals:

The Transportation/Circulation Citizens' Advisory Committee submitted a report to the Planning Board in 1978. That report contained recommendations setting goals and objectives for the future planning and development of transport facilities of all kinds in the Bozeman area. The following goals were recommended by the committee and adopted by the Bozeman Planning Board as guidelines to be followed in developing the Transportation Plan. The following are the major goals set forth by the committee.

a. Goals:

1) Establish a dynamic and safe circulation system that will accommodate different activities of the planning area.

2) Development of transportation facilities in and near Bozeman consciously designed so as to minimize the disruption of existing community and neighborhood living patterns and values, and to minimize the removal of productive land from tax rolls while providing for the transportation needs of the community.

3) To develop an optimum transportation system which locates, efficiently and conveniently, employment and service centers to residential areas which provides a balanced circulation system which accommodates pedestrian footpaths and bikeways, as well as other forms of non-automobile travel, yet is adequate enough to meet existing and future mobility and access demands of the entire planning area.

4) To develop a transportation system which promotes a high aesthetic quality and protects the area's unique scenic resources along major transportation corridors.

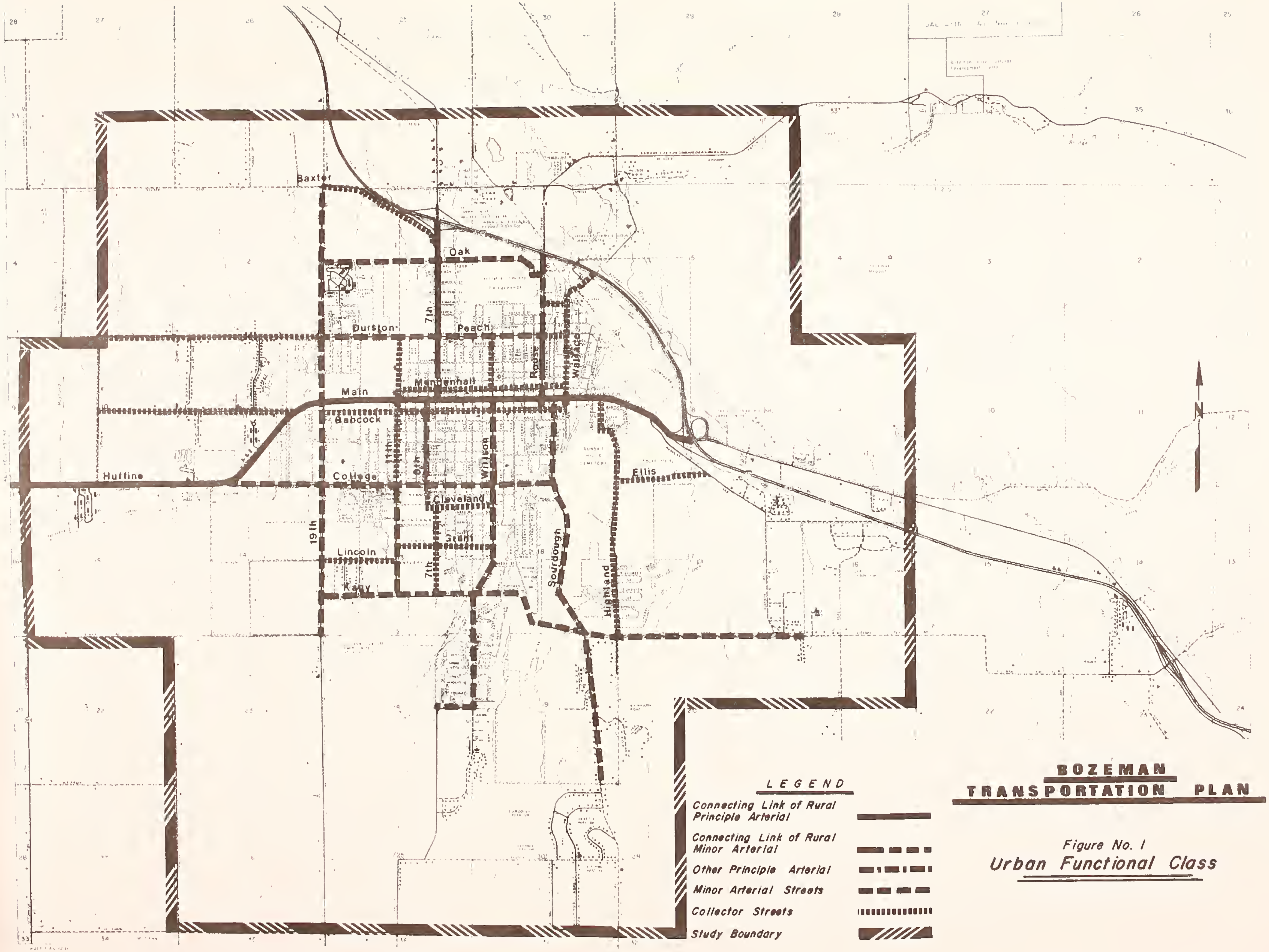
3. Scope of Work:

The Bozeman Urban Transportation Study was started in August of 1977. From that date to March 1981, the Montana Department of Highways prepared 14 technical memorandums, setting forth the data collected and the analysis of the data.

In August of 1981, the firm of Clete Daily and Associates was hired to complete the Transportation Plan. The memorandums, supplemented with field surveys to update some of the data, together with additional traffic assignments, have been used to complete the Bozeman Transportation Plan.

The scope of work that was contracted to be carried out by the consultant was made up of the following major work items:

a. Collect and review data.
b. Determine existing and future network problems.
c. Determine preliminary feasible alternates for testing.
d. Test and analyze alternate plans.
e. Develop short and long range plans.
f. Conduct public meetings and obtain plan approval.



BOZEMAN TRANSPORTATION PLAN

Figure No. 1
Urban Functional Class

CHAPTER II.

EXISTING TRANSPORTATION SYSTEM

This study concentrates primarily on the major street network serving motorized vehicular travel in the Bozeman Planning Area. This is the major transportation mode for moving people and goods within and through the Bozeman area. A brief description of the other modes of transportation serving the Bozeman area is also included in this section.

A. MAJOR STREET NETWORK

The street network studied in this project consists of the major traffic carriers within the Bozeman area. The initial system was selected based upon the functional classification of the streets in the Study area. Streets were rated by use, operational characteristics and importance in linking the system. They were then classified as:

1) Local - primarily providing access to abutting land;
2) Collector - collecting traffic from local streets and channeling it to the arterial system;
3) Arterial - streets connecting major activity centers and providing through traffic corridors in the Study area;
4) Interstate - access controlled, through traffic only.

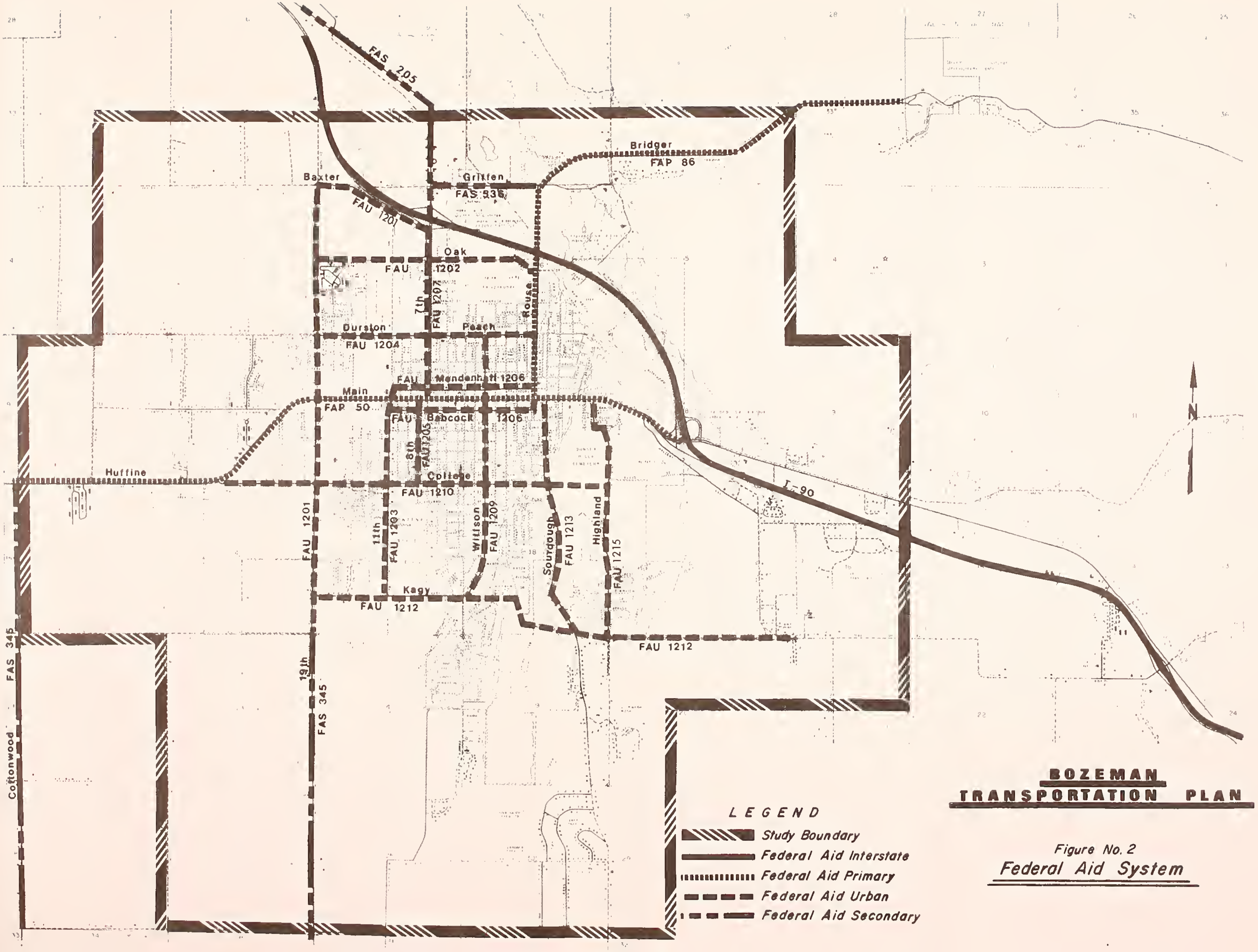
Figure 1 shows the functional classification of the Bozeman area street network. Most of the designated collectors, arterials and interstate routes were included in the major street network.

1. Committed Improvements:

Since the major street network was to be used to test the effects of future traffic volumes on the system, it was also desirable to include links within the system which were scheduled to be improved.

In October 1977, the Bozeman City Council set priorities on five committed improvement projects. The projects and priorities were subsequently approved by the TAC and PCC. They were as follows:

Priority #1 - 19th Avenue from Babcock to Durston Road.
Priority #2 - Kagy Boulevard from Highland Boulevard to 3rd Street.
Priority #3 - West Kagy Boulevard from 3rd Street to 19th Street.
Priority #4 - Oak Street from 7th Avenue to Rouse Avenue.
Priority #5 - 19th Avenue from Durston Road to Oak Street, Oak Street from 19th Avenue to 7th Avenue.



BOZEMAN TRANSPORTATION PLAN

Figure No. 2
Federal Aid System

These commited projects were also included in the Major Street System. Figure 2 shows the Federal Aid System and the funding classification for each route.

B. BUS SERVICE

Three bus operations provide service linking the Bozeman area with other areas in the state and with interstate services.

1. GREYHOUND:

Greyhound serves the City of Bozeman on a regular schedule. A total of nine buses enter and leave Bozeman daily. Four eastbound buses provide connections with other major lines at Billings, and four westbound buses provide connections at Missoula. One express bus passes through Bozeman daily. Greyhound also provides freight service on all buses.

2. KARST STAGE, INC.:

This company has permits to haul in all 50 states. Charter service originates out of Billings as well as Bozeman. The minimum load is ten (10) passengers, with a maximum capacity of 39 to 47 passengers per unit. Charges range from $1.00 to $1.50 per passenger mile. The corporation owns 20 charter buses.

Karst Stage, Inc. contracts with the Bozeman School District to provide bus service on 45 routes.

The company also makes two-three runs per day providing service to Bridger Bowl during the skiing season.

3. YELLOWSTONE PARK DIVISION, TWA SERVICES, INC.:

This company provides bus service to/from Bozeman and Gallatin Field to Big Sky and West Yellowstone. The present schedule is one bus a day. The company also provides snowcoach services within Yellowstone National Park.

4. PUBLIC BUS SERVICE:

Several attemps have been made to establish a commuter bus service within the Bozeman urban area. Due to lack of ridership and community support, none of the operations have been self-supporting.

In February 1980, TAC considered applying for funds to develop a transit improvement program for Bozeman. In April 1980, the City Commission voted to cancel any plans for conducting a transit feasibility study due to lack of public interest.

Increasing fuel and private vehicle operational costs may make a mass transit system feasible in the future. State law now provides that up to 12 mills can be levied in urban areas for the purpose of funding a transit district. Billings, Helena, Great Falls and Missoula now have public transit systems. All of these systems are subsidized by local and federal funds.

C. RAILROAD LINES

Bozeman had one of the state's earliest electric railways as well as the stae's first interurban system.

The Gallatin Light, Power and Railway Company operated an electrical railway system beginning in 1892, and operated until 1930. This system provided service along Main Street, Bozeman Avenue, Church Avenue, Rouse Avenue and Peach Street, with a connecting route to Montana State University.

The Gallatin Valley Electric Railroad provided service between Bozeman and Bozeman Hot Springs and Salesville. The company was purchased by Milwaukee Road in 1918. The electric passenger railway operation was discontinued in 1930.

Bozeman presently has no passenger train service, and has limited freight service. Burlington Northern, the only line serving Bozeman, has one employee located in Bozeman. There is no set schedule for trains entering and leaving Bozeman. The schedule is dependent on the major shippers. Grain and coal are the major products shipped from or through Bozeman. At the present time traffic averages approximately 18 trains per week.

D. AIR SERVICE

Air transportation for the Bozeman area is provided by Gallatin Field which is located near the town of Belgrade, nine miles west of Bozeman.

Regular commercial air service is provided by Northwest Airlines, which has four flights per day, and Frontier Airlines, which has three flights per day, with an additional flight on Saturdays.

Northwest Airlines provides east-west service extending from Portland to Washington, D.C., and Frontier Airlines provides north-south service extending from Missoula to Denver.

In 1980 a total of 70,253 passengers enplaned at Gallatin Field. In 1981 the total was 59,196 passengers. The 1980 figure was approximately 10,000 passengers higher than normal, due to temporary closures of the Helena and Butte airports. The yearly passenger volume is 59,000. In 1981, passengers were divided between the carriers as follows:

Northwest	- 29,000 passengers
Frontier	- 27,000 passengers
Charter	- 3,000 passengers

A new terminal was completed in 1978, and a number of operational improvements have been made in the last five years.

E. PEDESTRIAN/BICYCLES

The Montana State University campus is a major generator of pedestrian traffic. Other generators are the Junior and Senior High School areas, and Whittier School.

Recommendations for improving pedestrian facilities are included with street network improvement recommendations.

Bicycle travel has been steadily increasing in the Bozeman area. This is the primary mode of transportation for many Montana State University students. A project to develop a bicycle route map for the Bozeman urban area was funded by the Department of Natural Resources and Conservation in June 1981. The purpose of the project was to identify streets that would be most suitable for bicycle travel. As the Study progressed and a preliminary system was identified, it became apparent the persons using the bicycle as a major mode of transportation desire to travel on direct, through routes, the same as motorized vehicle operators. The following criteria were used to develop the bicycle route system:

1) Direct routes connecting major generators.

2) If possible, should be wide enough to accommodate bicycles and motorized vehicles in separate lanes.

3) Paved riding surface.

The Bozeman Bicycle Route Plan is shown in Figure 3. The designated routes are not signed at the present time. It is the purpose of the plan to concentrate bicycle travel on the selected routes. Motorists will expect the presence of bicycles on these routes, and the operation of the selected streets can be aimed at improving the safety and efficiency of both modes of travel.

F. TAXI SERVICE

Taxi service in Bozeman is provided by City Taxi. This company serves Bozeman, Belgrade, Big Sky and the surrounding areas. The company employs a maximum of four drivers during the day, and two at night. The average employment is two day drivers and one night driver. The company owns four cars and five vans.

Rates are based on a zone system, as well as distance, trip origin and number of persons. The maximum ridership, during cold weather, is approximately 140 passengers per day. Average ridership is approximately 60 per day.

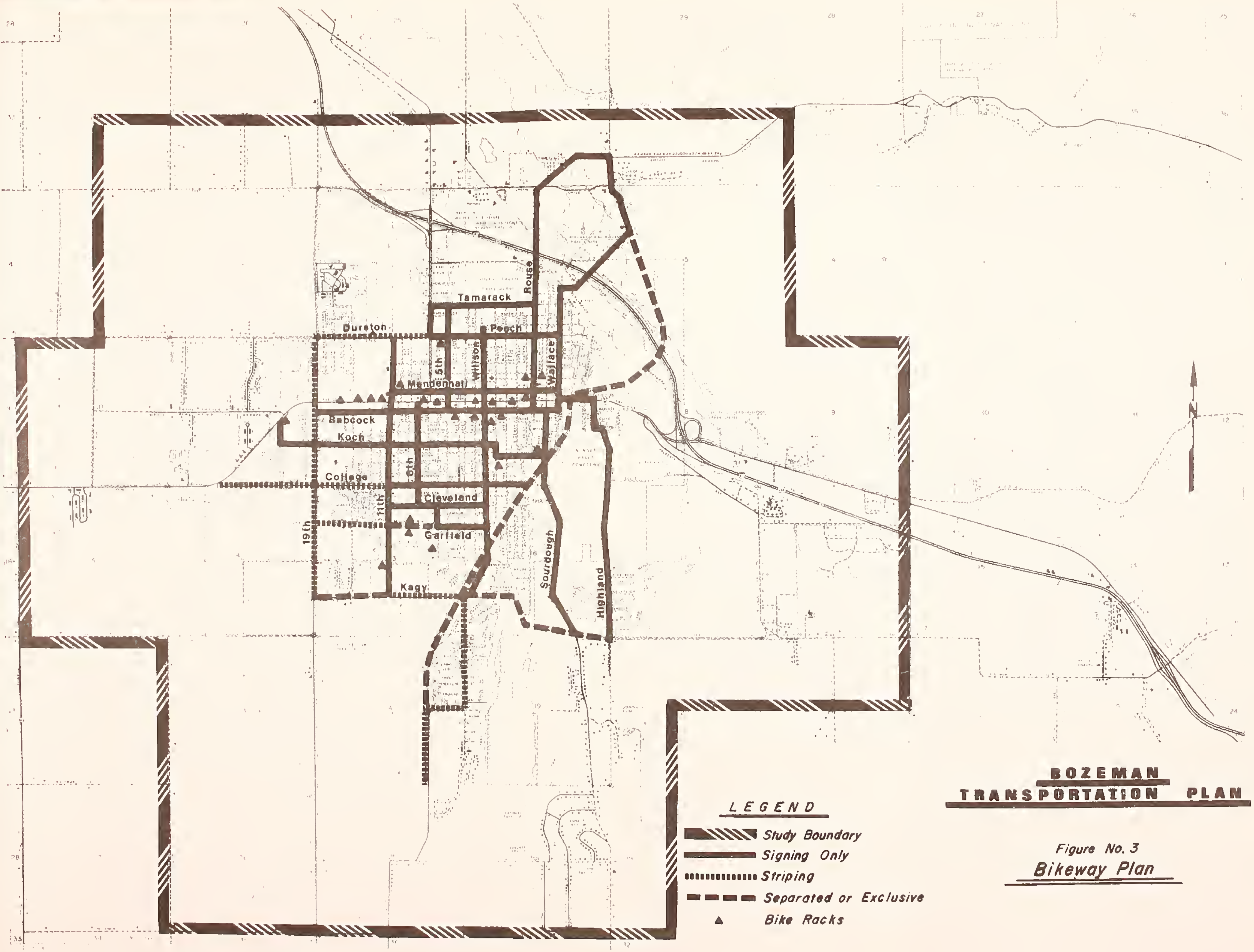


Figure No. 3
Bikeway Plan

CHAPTER III.

CURRENT STREET AND TRAFFIC CONDITIONS

A. TRAFFIC STUDIES

Since the initiation of the transportation study in 1977, a number of traffic studies have been carried out by the Montana Department of Highways. The consultant updated several of these studies to reflect 1981 conditions. The results of these studies were used to evaluate the operation of the major street system, and to identify network problems.

1. Traffic volumes:

When the transportation study was initiated in 1977, a number of supplemental traffic counts were made. These were:

a. Coverage Counts - mechanical traffic counts were taken at 132 locations. These counts were used to calibrate the traffic assignment model.

b. Screenline Counts - two screenlines were established, bisecting the study area in east-west and north-south directions. The east-west screenline generally parallels U.S. Highway 191 on the south side of the street. The north-south screenline parallels 7th Avenue. Major crossings of each screenline were counted. The counts were compared to the traffic assignment model as a test for accuracy.

c. Manual Classification Counts - traffic crossing the two screenlines was manually classified by vehicle type.

d. Annual Traffic Counts - The Montana Department of Highways takes annual mechanical traffic counts at 98 stations in the Bozeman urban area. These counts have been used to compile Figure 4, which shows 1981 traffic volumes[1] on the Major Street Network.

The traffic volumes shown have been averaged for each link in the system. Main Street carries the most traffic of any street in the system, with a maximum volume of over 20,000 vpd in the downtown area. Seventh Avenue also carries a high traffic volume, ranging up to nearly 18,000 vpd. Volumes on other streets in the system range from 400 to 9400 vpd.

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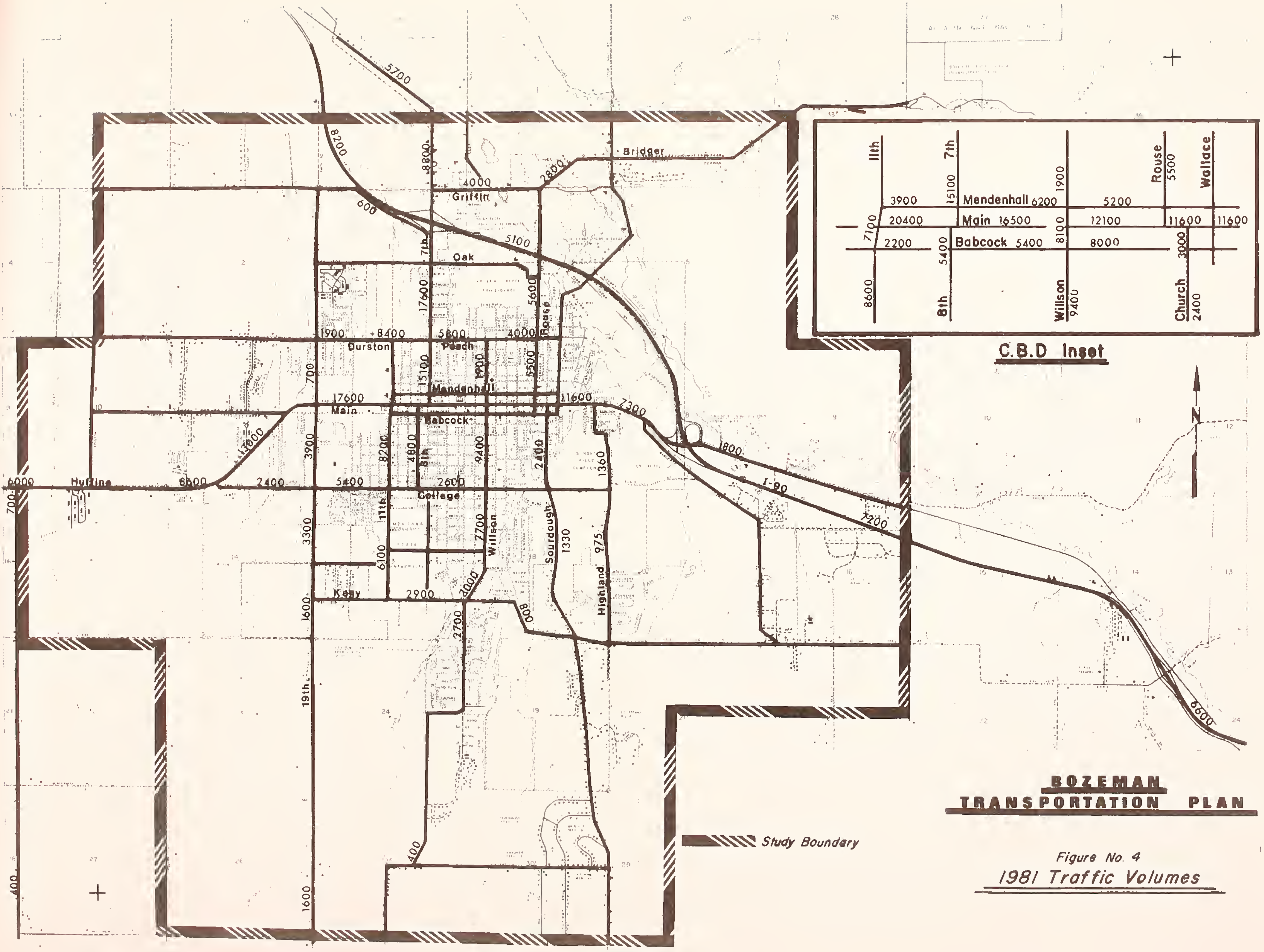
[1] All volumes are annual average daily traffic (AADT)



BOZEMAN

TRANSPORTATION PLAN

Figure No. 4

1981 Traffic Volumes

2. Travel Times:

One of the most important factors used to evaluate the operation of a street network is travel time. Time lost due to delays when traveling within the urban area is an economic loss to all users of the system, whether they are driving to/from work or operating a vehicle transporting goods.

A speed and delay study of the major street system was conducted in 1977 to determine average travel speeds for traffic assignment purposes.

Each street was driven five times, twice during the peak hour traffic period, and three times during offpeak hours. The average travel speed of the five runs was used as input to the traffic assignment model. Delays along each route, due to traffic control devices or congestion, were also recorded. The total time required to travel from the centerline of one intersection to the next was measured for each link of the Major Street Network.

The Consultant conducted a similar speed and delay study in 1981 to determine where changes had occurred in the system since 1977, and to locate bottlenecks in the system.

Table 1 is a comparison of the 1977 and 1981 speed and delay study results.

The major change in travel time from 1977 to 1981 occurred on Main Street, where traffic slowed an average of six miles per hour. The travel time survey showed that it was possible to travel from the east I-90 interchange to Ferguson Road in nine minutes, during offpeak traffic periods, while the same trip took 14 minutes during the peak hour traffic periods.

It was observed that the peak traffic periods are of fairly short duration, usually occurring for 20 minutes or less. During the evening peak, from about 5:10 p.m. to 5:30 p.m., backups were observed at the signals along Main Street and along North 7th. At times two or three cycles were required before a vehicle could clear an intersection. However, the duration of this congestion was usually less than 20 minutes. These factors should be carefully considered in proposing costly improvements to increase the major corridor travel times. It may not be cost effective to expend large sums of money to make improvements that will correct traffic problems which occur for only 15 to 20 minutes per day.

The major north-south corridors, South 11th and North 7th, did not have as extensive delays as the Main Street corridor. Eleventh Avenue, from Kagy to Durston, had a peak period travel time of six minutes, and an offpeak travel time of four minutes. The travel time on North 7th from Main to I-90 varied from five minutes, during the peak period, to four minutes during the offpeak periods.

BOZEMAN SPEED AND DELAY STUDY

COMPARISON - 1977 AND 1981

	AVERAGE SPEED - MPH		
	MDOH	CDA	
	1977	1980	DIFF.
MAIN ST. - FAS 345 TO WILLSON	28.9	24.9	-4.0
COLLEGE ST. - U.S. 191 TO WILLSON	20.1	22.0	+1.9
KAGY BLVD. AND HAGGERTY LANE FROM S. 11TH TO U.S. 191	24.7	24.3	-0.4
FERGUSON RD., DURSTON RD. AND PEACH ST. - U.S. 191 TO WALLACE	24.9	24.5	-0.4
MENDENHALL ST. - 11TH AVE. - WALLACE TO MAIN	15.4	16.7	+1.3
11TH AVE. - BABCOCK ST.- AND ROUSE AVE. FROM MAIN TO MENDENHALL	16.3	17.9	+1.6
NO. 7TH ST., R.R. OVERPASS TO MAIN	28.1	27.0	-1.1
ROUSE AND BRIDGER, BNDRY TO BABCOCK	30.2	N.A.	-
WILLSON ST., PEACH TO KAGY	18.1	18.6	+0.5
WALLACE AND HIGHLAND, I-90 TO KAGY	24.8	N.A.	
19TH AVE., DURSTON RD TO SO. BNDRY	27.7	30.7	+3.0
LINCOLN AND GRANT, SO. 19TH TO WILLSON	19.7	N.A.	-
11TH AVE., MENDENHALL TO KAGY	19.0	21.0	+2.0
MAIN ST., WILLSON TO E. BNDRY	30.8	22.1	-8.7
SO. 8TH AND 7TH, MAIN TO KAGY	19.8	18.9	-1.1
SOURDOUGH, BABCOCK TO GOLDENSTEIN	29.0	N.A.	-
SO. 3RD, KAGY TO SO. BNDRY.	34.1	31.8	-2.3

3. Accidents:

An analysis of accidents occurring on the street network was made to determine high hazard areas where a high number of accidents were occurring, and to determine operational improvements that could be made to lower the number of accidents at these locations.

The Montana Department of Highways conducted an accident study in March 1981. At that time it was determined that there were 19 locations within the transportation study area that had an average of five or more accidents for the years 1977 through 1979. Collision diagrams for each location were prepared showing the details of each accident. With the cooperation of the Bozeman Police Department, the accident study was updated to include 1980 and 1981 accidents. Table 2 shows general statistics relating to the 19 highest accident locations. Seven of the high accident locations are located on Main Street. These locations are at signalized intersections. The major collision type is rear-end, which is a typical result of signal installation. During 1980 and 1981 eight other intersections had five or more annual accidents. These locations are listed in Table 3.

Accident rates are a method of evaluating the significance of accidents at a given location. The accident rate takes into consideration the number of vehicles entering the accident location. The rate is expressed in terms of accidents per one million vehicle miles. Accident rates are shown in Tables 2 and 3. The accident rates show that the locations with the most accidents do not necessarily have the highest frequency of accidents. The location of Olive and Grand has the highest accident rate of the high hazard locations. This is due to the relatively low volume of traffic entering the intersection. The eight locations which had five or more accidents in 1980 and 1981 do not have sufficient accident history to establish a long-term accident rate; however, the calculated rates give a relative comparison of accident frequency.

In general, the locations with the highest accident rates are at intersections where sight distance is restricted, and the severity of the accidents is low. The predominant collision is the angle collision, resulting when a vehicle from the side street attempts to cross with insufficient clearance.

In 1981 the Bozeman Police Department began recording unreported accidents. These are accidents involving less than $250.00 in property damage, which exempts the drivers from filing the State accident report. The officer at the scene requires the drivers to exchange drivers' license numbers and insurance companies, but no detailed report is filed. Based on the 1981 traffic accident records, 47% of all accidents do not have a detailed report filed. In

HIGH ACCIDENT LOCATIONS
1977 - 1981

LOCATION	TOTAL NO. ACCIDENTS	COLLISION TYPE ANGLE	REAR-END	SIDE-SWIPE	OTHER	ROAD CONDITION DRY	ICY	SNOWY	WET	AV. ANN. ACCIDENTS	ACCIDENT RATE
Main & 7th	75	31	31	2	11	53	12	1	9	15.0	1.46
7th & Mendenhall	64	38	22	1	3	45	6	3	10	12.8	1.57
Main & 11th	55	14	34	2	5	29	11	1	14	11.0	1.17
Main & 15th	43	28	9	0	6	25	9	1	8	8.6	1.27
7th & Durston	56	31	17	2	6	41	7	1	7	11.2	1.27
Main & 5th	47	16	23	6	2	32	6	2	7	9.4	1.31
Main & Rouse	36	17	10	4	5	22	2	6	6	7.2	1.04
Main & 8th	39	8	29	1	1	26	8	1	4	7.8	0.91
Main & Willson	38	19	8	3	8	27	5	4	2	7.6	0.95
Olive & Grand	34	32	0	2	0	24	4	0	6	6.8	3.33
Willson & College	33	24	3	2	4	19	8	2	4	6.6	1.67
Olive & Bozeman	29	27	0	0	2	18	4	1	6	5.8	2.84
Babcock & Black	27	23	2	2	0	20	3	1	3	5.4	1.35
Willson & Mendenhall	30	24	1	2	3	17	5	5	3	6.0	1.49
Babcock & Tracy	25	19	1	4	1	18	2	0	5	5.0	1.25
Mendenhall & Black	23	19	0	4	0	19	1	1	2	4.6	1.46
Olive & 6th*	25	23	1	0	1	15	5	1	4	5.0	2.01
Black & Lamme*	25	24	1	0	0	15	6	0	4	5.0	2.28
7th & Aspen*	19	13	3	0	3	12	3	2	2	3.8	0.54
TOTAL	723	430	195	37	61	477	107	33	106	7.6	
Percent of Total	100	60	27	5	8	66	15	4	15		

* NOT ON MAJOR STREET NETWORK

TABLE 3

ADDITIONAL HIGH ACCIDENT LOCATIONS
1980 - 1981

	NO. ACCIDENTS			COLLISION TYPE			ROAD CONDITION				
LOCATION	1980	1981	ANGLE	REAR-END	SIDE-SWIPE	OTHER	DRY	ICY	SNOWY	WET	ACCIDENT RATE
Lamme & 5th Ave.[1]	8	-	7	-	-	1	7	-	1	-	1.96
Main & College	-	6	1	4	-	1	4	1	-	1	0.75
Willson & Babcock	-	6	3	2	1	-	4	1	-	1	0.51
Main & Grand	-	6	2	2	2	-	4	1	-	1	0.49
Koch & 15th Ave.[1]	5	-	4	1	-	-	3	-	1	1	1.52
Olive & Willson	5	-	3	2	-	-	-	4	-	1	0.58
Babcock & 11th	5	-	3	1	1	-	3	2	-	-	0.63
Main & Tracy	-	5	1	2	2	-	4	-	-	1	0.41
TOTAL	23	23	24	14	6	2	29	9	2	6	
Percent of Total	50	50	52	30	14	4	67	21	4	14	

[1] NOT ON MAJOR STREET NETWORK

reviewing the police records for 1981, it was noted that many of these minor accidents occur at locations on the periphery of the downtown area where sight distance is restricted by onstreet parking. Each accident collision diagram has been evaluated and used as a basis for many of the minor improvement recommendations.

4. Street Capacities:

The capacity of a street is the maximum number of vehicles which has a reasonable expectation of passing over a section of roadway under prevailing roadway and traffic conditions. Capacity is also related to level of service. For example, in traffic engineering terms, the possible capacity of a street is level of service E, which is defined as a traffic flow condition at which traffic flow is unstable and there may be stoppages of momentary duration. Table 4 shows the level of service at signalized intersections.

The six levels of service are described as follows:

Level of Service	Conditions
A	Free flow; drivers can maintain their desired speed with little or no delay.
B	Stable flow; drivers still have reasonable freedom to select their speed and lane of operation.
C	Stable flow; most drivers are restricted in their freedom to select their own speed, change lanes or pass.
D	Approaching unstable flow; drivers have little freedom to maneuver, and comfort and convenience are low, but conditions can be tolerated for short periods of time.
E	Unstable flow; stoppages of momentary duration.
F	Forced flow; section serves as a storage area during part or all of peak hour; speeds are reduced substantially, and stoppages may occur for short or long periods of time because of downstream congestion.

For the purposes of the study all capacities have been calculated for level of service C, which is referred to as "Design Capacity". The traffic condition is stable flow with most drivers restricted in their freedom to select their own speed, change lanes and pass. This level of

TABLE 4

COMPARISON OF 1977 AND 2000 LEVEL OF SERVICE

PEAK HOUR

Location	Level of Service	
	1977	2000
7th & Durston		
N Leg	B	F
S Leg	B	F
E Leg	A	A
W Leg	A	F
7th & Main		
N Leg	F	F
E Leg	B	F
W Leg	F	F
8th & Main		
S Leg	C	F
E Leg	F	F
W Leg	A	F
Willson & Main		
N Leg	A	C
S Leg	B	F
E Leg	E	F
W Leg	B	F
Black & Main		
N Leg	A	A
S Leg	A	A
E Leg	D	F
W Leg	A	F
Rouse & Main		
N Leg	A	F
S Leg	F	F
E Leg	F	F
W Leg	F	F
Rouse & Mendenhall		
N Leg	E	F
S Leg	B	F
E Leg	A	A
7th & Mendenhall		
N Leg	A	F
S Leg	A	F
E Leg	E	F
11th & Main		
N Leg	A	D
S Leg	A	B
E Leg	F	F
W Leg	F	F
5th & Main		
N Leg	A	A
S Leg	A	A
E Leg	E	F
W Leg	F	F
Willson & Babcock		
N Leg	C	E
S Leg	E	F
W Leg	F	F

service most commonly occurs in Bozeman at the noon hour, when traffic generally moves steadily through the major corridors at a steady flow. Levels of service D, E and possibly F, occur during the evening peak when peak traffic occurs over a short period of time, resulting in congestion and delays.

The capacity of a street is usually controlled by the intersecting streets. At signalized or four-way STOP intersections, each street is allocated a proportional amount of "Green Time". This is the time that the traffic on the street can move freely through the intersection.

The ratio of volume to capacity is used to determine the level of service at which an intersection approach is operating. A v/c ratio of 1.00 indicates that the approach is operating at design capacity or level C. Table 4 shows the 1977 and 1981 levels of service for the signalized intersections within the study area.

5. Truck Survey:

Truck traffic through the Central Business District was identified as a traffic problem that should be investigated. The 1977 origin-destination, external survey interviewed outbound traffic at 13 locations on routes crossing the study area boundary. Interviews of outbound trucks were conducted from 6:00 a.m. to 10:00 p.m. Table 5 shows the actual number of trucks passing through each external station over the 16-hour period.

TABLE 5

1977 OUTBOUND TRUCK TRAFFIC AT EXTERNAL STATIONS

6:00 a.m. to 10:00 p.m.

STATION NO.	LOCATION	THRU TRUCKS	TRUCKS STOPPING IN BOZEMAN	TOTAL
107	Bridger Canyon Road	11	19	30
108	Story Mill Road	4	25	29
109	Manley Road	0	0	0
110	Old U.S. 10	13	100	113
111	I-90 West	27	85	112
112	Baxter Road	0	2	2
113	West Main	40	53	93
114	South 19th	9	14	23
115	South 3rd	0	1	1
116	Sourdough Road	0	2	2
117	Kagy Boulevard	0	0	0
118	I-90 East	43	61	104
119	East Main	4	4	8
TOTAL		151	366	517

Table 5 shows that the stations with the highest number of outbound trucks were Old U.S. 10, I-90 West, I-90 East and West Main. The station on East Main (119) was located east of the I-90 interchange, and so does not reflect actual truck traffic passing through the C.B.D. on Main Street.

Additional information on truck travel in the Bozeman area was collected during November 1981. A survey of east and westbound trucks passing through the intersection of Main and Rouse was conducted using a citizens band (C.B.) radio. A total of 99 truckers was interviewed over a two-week period.

The following is a summary of the responses to the truck survey:

* Fifty-five percent of the drivers said they were traveling on Main Street because it was a more direct route.

* Sixteen percent of the drivers were on Main Street because they had deliveries to make.

* Eighteen percent preferred the Main Street route for personal reasons, such as: Provided a break from the Interstate, enjoyed sight-seeing, etc.

* Three percent of the drivers stopped to eat or shop.

* Two percent of the drivers said they were on Main Street because they were lost.

* Fifty-eight percent of the trucks were refrigerator or flatbed trucks. These trucks generally haul foodstuffs or heavy equipment and building materials.

* Eight percent of the trucks were log trucks.

* The remaining 34% included the following types: Cattle, moving van, box, open and other.

* Fifty-eight percent of the trucks came into the area on 191 East, and 27% entered on 191 West. Eleven percent entered on 7th Avenue North, four percent other.

* Trucks exiting Bozeman used the following routes: 191 East - 68%, 191 West - 12%, 7th Avenue North - 9% and other routes - 11%.

* When asked if there was an alternate route, the drivers responded as follows: No other route - 31%, too long, 33%, too rough - 4%, Belgrade - 7%, undecided or no response - 25%.

The findings of the truck survey are a basis for some of the recommendations contained in Chapter V of this report.

6. Parking:

a. Central Business District

Transportation terminal facilities are an important component of the transportation network. Inadequate parking facilities at major trip ends result in increased travel and congestion, as drivers search for a parking space. Parking facilities also have a significant impact on land uses. Where parking is inadequate to serve the traffic generated, onstreet parking overflows into surrounding neighborhoods, causing traffic congestion and disrupting residential neighborhoods.

A detailed parking study was beyond the scope of this project; however, trip end estimates from the traffic assignment model and other parking studies have been used to analyze the base parking system.

The 1977 traffic assignment model estimated that there were 39,000 trip ends generated by the Bozeman Central Business District. (CBD) This is the area bounded by Lamme on the north, Olive on the south, Wallace on the east and 5th on the west.

A comparison of parking supply and demand was also made for the core area which is bounded by Mendenhall on the north, Babcock on the south, Rouse on the east and 3rd on the west.

Using parking durations from other studies and the trip purpose from the 1977 traffic assignment model, the 1977 trip ends were converted to short and long-term parking demands. The short-term parker was assumed to park an average of 49 minutes. A long-term parker stays an average of two hours and 50 minutes.

Short-term parker trip purposes include such activities as shopping, business, medical-dental and eat and drink, while the long-term parker is predominantly a worker in the downtown area.

In November 1981 an inventory of offstreet and on-street parking spaces in the CBD was made.

Table 6 compares the 1977 estimated parking space demands to the 1981 parking supply.

TABLE 6

1977 PARKING DEMAND-VS - 1981 SUPPLY

	DEMAND			
AREA	SHORT TERM	LONG TERM	SUPPLY	SURPLUS/ DEFICIENCY
C.B.D.	911	1125	3987	+1951
CORE	766	517	1087	- 196

The deficiency in the core area is primarily due to short-term spaces being occupied by long-term parkers. The shortage in this area will be increased as it becomes necessary to remove onstreet parking to accommodate increased traffic, and to improve sight distance at intersections.

Future parking needs and recommended improvements are included in Chapter V.

b. Montana State University

A Traffic and Parking Study[1] for the MSU campus was conducted in 1971. That study estimated that there would be a need for 984 additional parking spaces to meet the projected parking needs on campus.

In 1979 the University conducted a survey of all campus employees (faculty, professional and classified).[2] The purpose of the survey was to determine travel and parking characteristics and preferences. The following is a summary of that survey:

* Autos registered (staff decals) - 1748

* Autos normally driven each day - 1040 (59% of registrations)

* Persons carried in autos - 1346 (1.3 per vehicle)

* Persons who normally walk to campus - 185

* Campus entrance normally used:

College and 11th - 31%
Grand and 6th - 19%
College and 8th - 15%
Lincoln and 11th - 11%
Kagy and 7th 9%
Cleveland and 7th - 7%
Others - 8%

* Conflicts of preference and normal use of parking areas:

Grant Street Lot - preferred by 13% more than those able to use it.
Hamilton Lot - 105%
CAC Lot - 21%
Linfield Lot - 100%
Greenhouse Lot - 43%
North Fieldhouse Lot - 81%

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[1] Reference #4

[2] Reference #6

The campus survey did not include students; however, travel patterns are probably similar to those of staff and employees. The campus entrances normally used are especially significant in planning for the street network serving the campus area. This information and the ranking of major traffic generators on-campus have been used to develop recommendations for improvements in the vicinity of Montana State University.

7. System Observations:

The Bozeman Police Department deals with traffic on the street system every day. A questionnaire was distributed through the Police Department requesting each officer to list major problem areas encountered on the street system. The responses mentioned many of the problem areas identified in other surveys, as well as additional problem areas that could only be identified by spending extensive periods of time traveling on the street system. For example, traffic problems associated with special events on the university campus were identified. The patrolmen's comments were especially helpful in locating operational deficiences in the system and other minor safety problems which were not identified in the accident survey. Some of the problems and comments identified by the survey were:

*Extend Babcock one-way to 11th Avenue.

*Install signals at:

1) 15th and Main.
2) 19th and Main.
3) U.S. 191 and College (Main Mall).
4) Main and Church.

*Install STOP signs at Olive and Bozeman and Olive and Tracy.

*Mark right turn lane on the north leg of 7th Avenue and Durston Road and on 11th at Main.

*Improve southbound traffic sight distance at Babcock and Bozeman and Babcock and Tracy.

*Install right turn bays on the east legs of Main and 15th and Main and 7th.

*Remove parking one-side on Lamme, and make it a through street.

*Complete Tamarack to 7th Avenue.

*Install sidewalks on West College from 11th Avenue to Main Street.

*Widen Durston Road from 7th Avenue to 23rd Avenue.

*Widen South 3rd to provide a turn lane and sidewalks from Kagy Boulevard to one mile south.

*Extend Kagy Boulevard from 11th Avenue to 19th Avenue.

*Extend 19th Avenue to I-90 and construct interchange.

*Pave Kagy Boulevard.

*Make Olive and Lamme one-way.

*Install left turn arrows at 7th Avenue and Durston Road.

*Install signal at Wallace and Main.

*Reinstall NO LEFT TURN signs on Main Street.

*Install overhead lane control signs at major intersection.

*Erect speed limit (15 MPH) signs at Mendenhall and Rouse and 20th and Beall.

CHAPTER IV.

FUTURE TRAFFIC

Future travel demands for the Bozeman area were estimated by using a trip generation model which predicts the number of future trips from a zone of homogenous land uses to other zones, and a traffic assignment model which assigns trips over the street network based upon the route of minimum travel time. The basic steps required to develop the models and the findings from test systems and other investigations are set forth in this chapter.

A. SOCIO-ECONOMIC PROJECTIONS

The study area was divided into 106 traffic analysis zones. The following factors were considered in establishing the zones:

Street Network - Zone boundaries should follow the major street network.

Planning Boundaries - The 1973 Comprehensive Plan was divided into nine analysis sectors. Zone boundaries followed those boundaries as much as possible.

Manmade and Natural Boundaries - Zone boundaries followed the railroad tracks and interstate highway. Natural boundaries create few barriers in the Bozeman area.

Homogenous Land-use Zones: Zones encompassed homogenous land uses in order to group uses having similar trip generating characteristics.

Size and Shape - Zone sizes and shapes were adjusted based on development density. In high-density areas small zones were used with larger zones located in outlying low-density areas.

The Bozeman trip generation model uses the following factors to forecast trips:

Number of dwelling units.
Population.
Employment by zone of work.
Employees by zone of residence.

These factors were estimated for each zone for the years 1977, 1985, 1990 and 2000. The estimates and distribution were carried out by the Bozeman Planning Staff.

Table 7 shows the study area total for each of the trip generation factors for the years 1977, 1985, 1990 and 2000. These totals were

distributed to the 106 traffic analysis zones, and the number of trips attracted and produced were estimated, using equations developed by other studies where actual interviews were conducted to determine travel characteristics.

TABLE 7

STUDY AREA SOCIO-ECONOMIC FACTORS - 1977, 1985, 1990, 2000

FACTOR	1977	1985	1990	2000
Dwellings Units	6,748	9,852	12,172	17,712
Population	24,345	33,200	39,910	56,132
Employment-zone of Work	10,018	12,568	14,447	18,969

B. TRAFFIC PROJECTIONS

1. Traffic Assignment Model:

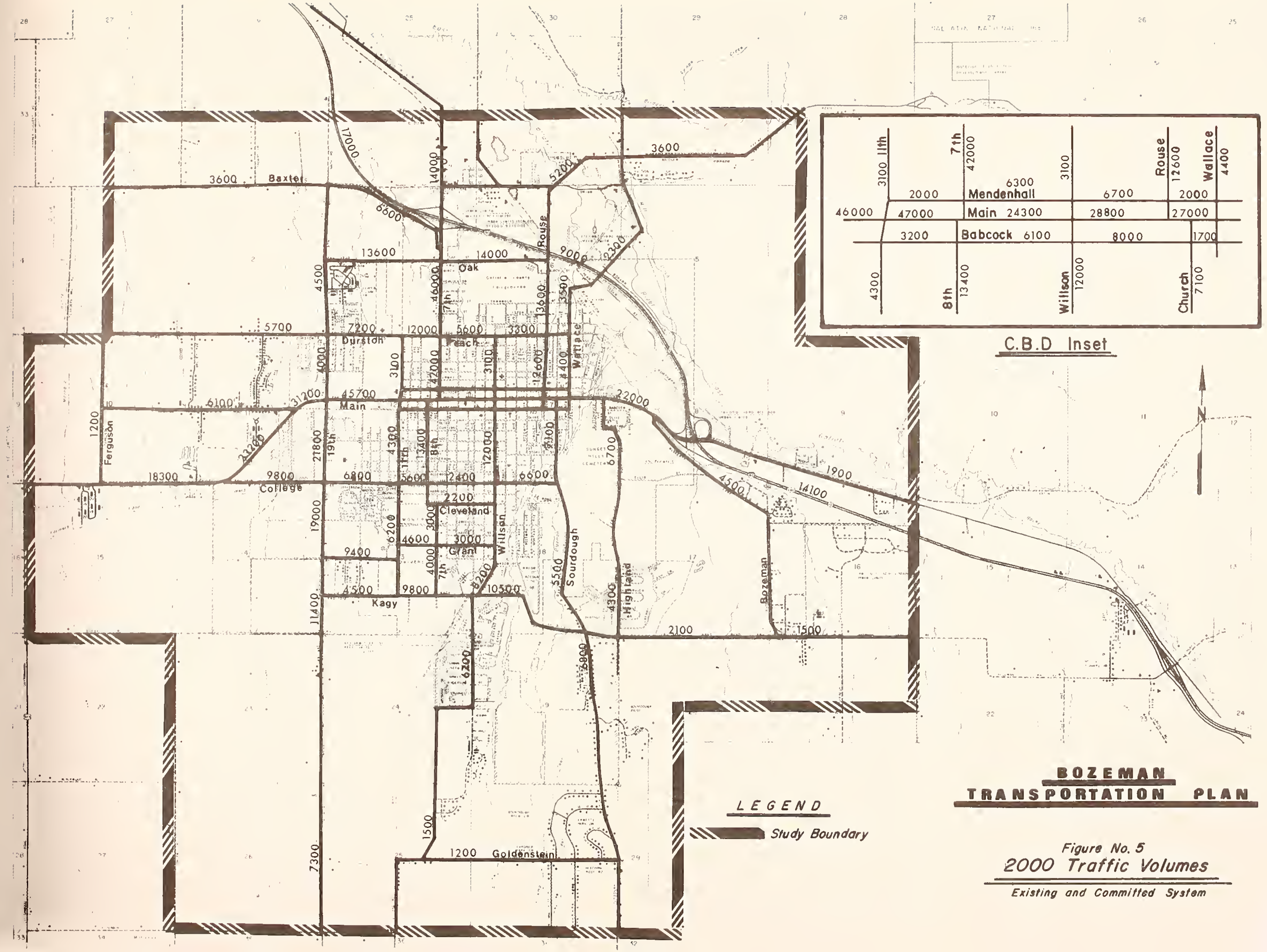
The existing (1977) trip productions and attractions were assigned to the Major Street Network. The assigned volumes were compared to the actual traffic counts, and adjustments were made to calibrate the traffic assignment model. The final model compared to within 96.5% of the actual traffic counts that were made along the east-west screenline and 98.0% along the north-south screenline.

2. Future Traffic:

The projected traffic was assigned to the existing and committed system. The year 2000 traffic volumes are shown on Figure 5.

The following is a summary of the major findings in comparing 1981 and 2000 traffic volumes on the existing and committed system:

- Traffic on West Main Street increases from 17,600 to 45,700 vpd.
- Traffic on North 7th Avenue increases from 15,100 to 42,000 vpd.
- Traffic on Durston Road at North 7th Avenue increases from 8100 to 12,000 vpd.
- Traffic on South 19th Avenue increases from 3900 to 21,800 vpd.
- Traffic on South 3rd increases from 2700 to 6700 vpd.



BOZEMAN TRANSPORTATION PLAN

LEGEND

▨ Study Boundary

Figure No. 5
2000 Traffic Volumes

Existing and Committed System

- Traffic on 19th Avenue near Main Street increases from 3900 to 21,800 vpd.
- Traffic on North Rouse increases from 5800 to 13,600 vpd.
- Traffic on Kagy Boulevard increases from 1300 to 10,500 vpd.

Table 8 compares standard roadway capacities based on existing geometrics and functional classification to year 2000 projected traffic volumes. The capacities shown in Table 8 are based on level of service C which is a free-flowing condition which is considered as design capacity for urban areas. A complete Table of Standard Roadway Capacities is shown in Appendix B. A v/c ratio of 1.00 indicates that the street would be functioning at level of service C. The following v/c ratios indicate the level of service shown:

Level of Service	V/C
A	0.86
B	0.91
C	1.00
D	1.14
E	1.20
F	1.27

Table 8

VOLUME/CAPACITY COMPARISONS - 2000 VOLUMES

ROUTES	NUMBER LANES	FUNCTION	2000 VOL.[1]	CAPACITY[2]	V/C
I-90	4	Freeway	17,000	40,000	0.42
Main Street	4	Principal Arterial	45,700	17,000	2.68
Rouse	2	Minor Arterial	13,600	10,000	1.36
Old U.S. 10	4	Minor Arterial	14,000	14,000	1.00
19th	2	Minor Arterial	21,800	10,000	2.18
11th (Kagy-College)	2	Minor Arterial	6,200	10,000	0.62
11th (College-Durston)	2	Collector	4,300	6,000	0.72
Durston (19th-7th)	2	Minor Arterial	12,000	10,000	1.20
Durston (19th-Ferguson)	2	Collector	5,700	6,000	0.95
8th	2	Minor Arterial	13,400	10,000	1.34
Mendenhall (one-way)	2	Collector	6,700	11,000	0.61
North 7th	4	Principal Arterial	46,000	19,000	2.42
Babcock (one-way)	2	Collector	8,000	6,000	1.33
Willson	2	Minor Arterial	12,000	10,000	1.20
College	2	Minor Arterial	9,800	10,000	0.98
Kagy	2	Minor Arterial	10,500	10,000	1.05
Sourdough	2	Minor Arterial	7,100	6,000	1.18
Highland	2	Collector	6,700	6,000	1.12
Oak	-	Minor Arterial	14,000	14,000 (4-lanes)	1.00

[1] E&C System - maximum volume

[2] Design Capacity - level of service C

From Table 8 it can be seen that the routes in the system which will be functioning at or over possible capacity (level of Service E) by 2000 are:

- Main Street (West of 11th)
- Rouse Avenue (North of Main)
- 19th Avenue (South of Main)
- Durston Road (West of 7th)
- 8th Avenue (South of Main)
- North 7th (North of Durston)
- Babcock (East of Willson)
- Willson (South of Babcock)

Other street sections exceed Design Capacity (Level C), but are still within possible capacity (Level E).

3. Test Systems:

A total of 13 test systems were run to compare various network improvements. The background system for all tests was the Existing plus Committed System (E+C), which included the major street network plus improvements to Kagy Boulevard and the extension of Kagy from 11th to 19th Avenue, and the extension of Oak Street from North 7th Avenue to Rouse Avenue. The following is a summary of the alternate improvements and the test findings. Some of the major social, economic and environmental improvements are also defined.

Test Run #1

Proposed Improvements:

*Reconstruct 19th Avenue (FAU 1201), from Babcock[1] Street to Durston Road to a wide two-lane facility.

*Minor widening of Durston Road from 19th Avenue to 7th Avenue.

General Assignment Results:

*Traffic on Kagy Boulevard increases by 200 vpd to 1,300 vpd.

*Traffic on 19th increases by 300 vpd to 6,100 vpd.

*Traffic on Main is reduced by 600 vpd to 1,100 vpd between 7th Avenue and 19th Avenue.

*19th Avenue from Main to Durston will be capable of handling the projected volume of 8,600 vpd with the proposed improvements.

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[1] To be constructed to four-lane

*19th Avenue South and portions of Kagy will be over capacity by 2,000, and will be carrying volumes requiring a four-lane capacity.

Social and Environmental Impacts:

*Increased noise levels in the area of the nursing home located near the intersection of 15th Avenue and Durston Road.

*Neighborhoods adjacent to 19th Avenue and portions of Kagy Boulevard will experience a degradation of air quality due to increased traffic congestion.

*Increased Vehicle Miles of Travel (VMT) of approximately two percent over the E+C system will result in increased fuel consumption. Decreased congestion on Main resulting in shorter traffic delays will offset a portion of this.

Test Run #2

Proposed Improvements:

*Reconstruct 19th Avenue (FAU 1201), from Babcock Street to Oak Street to a wide, two-lane facility.

*Improve Oak Street from 7th Avenue to Rouse Avenue, and extend Oak Street from 19th Avenue to 7th Avenue.

General Assignment Results:

*Oak Street carries 9,600 vpd between 19th Avenue and 7th Avenue, and has an increase in traffic from 14,100 vpd to 15,500 vpd between 7th Avenue and Rouse Avenue.

*Traffic on Durston Road between 19th Avenue and 7th Avenue decreases from 10,700 vpd to 6,600 vpd.

*Traffic on 7th Avenue between Oak Street and Main Street decreases by 4,700 vpd to 5,100 vpd.

*Traffic on Rouse Avenue between Oak Street and Main Street increases by 1,300 vpd.

*Traffic on Main Street decreases by 4,100 vpd to 5,700 vpd betwen 19th Avenue and 7th Avenue, and by 200 vpd to 4,000 vpd between 7th Avenue and Rouse Avenue.

*Portions of 19th Avenue, north of Babcock and Oak Street, east of 7th Avenue, would require four lanes by 2000.

*VMT increased approximately two percent over the VMT on the E+C system.

Social and Environmental Impacts:

*Right-of-way requirements will impact adjacent property owners, especially in the area of the Oak Street extension where all new right-of-way will be required.

*The Oak Street extension requires two stream crossings, and may encroach on park lands, causing substantial environmental impact.

*The increased fuel cost, due to increased VMT, will probably be offset by reduction in stops and delays on 7th Avenue and Main Street.

Test Run #3

Proposed Improvements:

*Upgrade College Street to an improved, two-lane facility from West Main to Willson Avenue.

*Extend College Street from Willson Avenue to Highland Boulevard.

General Assignment Results:

*Traffic on College Street increases by 2,900 vpd to 3,800 vpd between 19th Avenue and Willson Avenue.

*Traffic on Main Street decreases by 600 vpd to 800 vpd between College Street and 15th Avenue.

*Traffic on Highland Boulevard between College Street extension and West Main Street increases by 1,800 vpd.

*Traffic on Kagy Boulevard increased by 900 vpd 1,600 vpd from 19th Avenue to Sourdough Road.

*Traffic on Sourdough Road increases by 700 vpd to 1,400 vpd from Kagy Boulevard to West Main Street.

*Four lanes would be required on College Street by 2000.

*Portions of Kagy Boulevard and 19th Avenue would be over two-lane capacity by 2000.

*Traffic would be reduced on portions of Willson Avenue, 8th Avenue and 11th Avenue.

*Total study area VMT would increase approximately two percent over the E+C vehicle miles of travel.

Social and Environmental Impacts:

*Additional right-of-way would be required through existing residential neighborhoods along existing College Street, and new right-of-way would be needed from Willson Avenue to Highland Boulevard.

*The alignment goes near a public school and cemetery, and would require two stream crossings on the section from Willson Avenue to Highland Boulevard.

*The additional VMT may require higher fuel consumption but would result in similar trade-offs discussed in Test Runs #1 and #2.

Test Run #4

Proposed Improvements:

*Upgrade Peach Street from Wallace Avenue to 7th Avenue, and Durston Road from 7th Avenue to Ferguson Road.

*Improve Ferguson Road from Durston Road to U.S. 191.

General Assignment Results:

*Traffic on Peach Street increased by 1,900 vpd to 2,400 vpd from Willson Avenue to 7th Avenue.

*Traffic on Durston Road increased by 100 vpd to 3,000 vpd from 7th Avenue to Ferguson Road.

*Traffic on Main Street decreased by 700 vpd to 1,400 vpd from Willson Avenue to 11th Avenue and remained nearly the same on west to Ferguson Road.

*The network VMT increased by approximately two percent.

Social and Environmental Impacts:

*Traffic increases on Durston Road and Peach Street would impact the Gallatin County Nursing Home, a proposed school near the intersection of Durston Road and 15th Avenue, and a school located on Peach Street between 5th and 6th Avenues.

*Some additional right-of-way would be required, involving both public and private land.

*Increased VMT may result in increased fuel consumption.

Test Run #5

Proposed Improvement:

- *Upgrade Sourdough Road from Main Street to the south study area boundary.

General Assignment Results:

- *Traffic on Sourdough Road increases by 400 vpd to 2,200 vpd from the south study area boundary to Main Street.
- *Traffic on Willson Avenue decreases by 200 vpd to 400 vpd from Kagy Boulevard to Main Street.
- *Traffic on Highland Boulevard decreases by 900 vpd from Kagy Boulevard to West Main Street.
- *Traffic on Main Street west of Wallace Avenue decreases by 500 vpd.
- *Traffic on Kagy Boulevard increases by 300 vpd to 1,000 vpd from 19th Avenue to Sourdough Road.
- *VMT increased approximately two percent over E+C system.

Social and Environmental Impacts:

- *Additional right-of-way would be required through existing residential areas with possible encroachment on park land and wet lands.
- *This improvement did not significantly reduce traffic on adjacent facilities. Fuel consumption would be increased due to increased VMT.

Test Run #6

Proposed Improvements:

*Develop a circumferential loop consisting of the following links:

1. Highland Boulevard from Main Street to Kagy Boulevard.
2. Kagy Boulevard from Highland Boulevard to 19th Avenue.
3. Nineteenth Avenue from Kagy Boulevard to Oak Street.
4. Oak Street from 19th Avenue to Rouse Avenue.
5. Rouse Avenue from Oak Street to Main Street.
6. Main Street from Rouse Avenue to Highland Boulevard.

The loop would be an improved two-lane facility with future four-lane capability.

General Assignment Results:

*Traffic on Highland Boulevard increases by 1,400 vpd.

*Traffic on Kagy Boulevard increases by 200 vpd to 1,300 vpd from Highland Boulevard to 19th Avenue.

*Traffic on 19th Avenue increases from 300 vpd to 1,900 vpd from Kagy Boulevard to Main Street and by 11,200 vpd from Main Street to Durston Road. From Durston Road to Oak Street the increase is 8,000 vpd.

*Oak Street carries a volume of 9,200 vpd from 19th Avenue to 7th Avenue, and 14,000 vpd from 7th Avenue to Rouse Avenue.

*Traffic on Rouse Avenue increases by 2,200 vpd from Oak Street to Main Street.

*Traffic on Main Street increases by 1,100 vpd from Rouse Avenue to Highland Boulevard.

*Major traffic decreases resulting from the loop are:

Main St. from 19th Ave. to 11th Ave. - 6,100 vpd.

Main St. from 11th Ave. to Rouse St. - 3,700 vpd.

7th Ave. from Oak St. to Main St. - 5,400 vpd.

Durston Rd. from 19th Ave. to 7th Ave.- 3,700 vpd.

Sourdough from Kagy Blvd. to Main St. - 1,300 vpd.

*Traffic on the following links would require four lanes by 2000:

Kagy Blvd. from Willson Ave. to 7th Ave.

19th Ave. from Lincoln Rd. to Oak St.

Oak St. from 7th Ave. to Rouse Ave.

Rouse Ave. from Oak St. to Main St.

*Total VMT would be reduced indicating a fuel savings.

Social and Environmental Impacts:

*Increased traffic on the loop would cause increased

noise and CO levels in adjacent neighborhoods; however, these would be offset to a degree by decreased congestion on adjacent routes.

*Additional right-of-way would be required.

*There would be an overall reduction in fuel consumption.

Test Run #7

Proposed Improvements:

*Develop same circumferential loop as tested in Test Run #6.

*Improve College Street and extend from Willson Avenue to Highland Boulevard.

*Develop Lamme and Olive as opposing couplets to Mendenhall and Babcock.

General Assignment Results:

*Traffic on Highland Boulevard increases by 2,800 vpd over Test Run #6, due to the extension of College Street.

*Traffic on College Street increases by 2,100 vpd to 3,800 vpd between Main Street and Willson Avenue. The traffic volume on the extension from Willson Avenue to Sourdough Road is 10,300 vpd, and from Sourdough Road to Highland Boulevard is 4,700 vpd.

*Traffic on Main Street between 11th Avenue and Wallace Avenue is decreased by 3,600 vpd to 8,800 vpd.

Social and Environmental Impacts:

*All impacts described in Test Run #6, plus:

*Additional couplets would increase traffic through residential areas, near schools and near the hospital, resulting in slightly higher noise and lower air quality.

*This system would result in a fuel savings over Test Run #6.

Test Run #8

Proposed Improvements:

*Beginning with the 1977 Existing System, extend Kagy Boulevard from 11th Avenue to 19th Avenue.

General Assignment Results:

*The extension of Kagy Boulevard would carry 4,400 vpd.

- *Traffic on 19th Avenue between Kagy Boulevard and Lincoln Road would increase by 3,000 vpd.

- *Traffic on Lincoln Road from 11th Avenue to 19th Avenue would decrease by 3,100 vpd.

Social and Environmental Impacts:

- *New right-of-way would be required from 11th Avenue to 19th Avenue, causing an impact on landowners and wildlife in the area.

Test Run #9

Proposed Improvement:

- *Beginning with the 1977 Existing System, improve 19th Avenue from Main Street to Oak Street, and Oak Street from 19th Avenue to 7th Avenue. Test as two-lane facilities with four-lane capability.

General Assignment Results:

- *Traffic on Main Street is decreased by 5,200 vpd to 7,700 vpd between 19th Avenue and 7th Avenue.

- *Traffic on 7th Avenue is decreased by 6,600 vpd between Oak Street and Main Street.

- *Traffic on Durston Road is decreased by 2,700 vpd to 4,100 vpd between 19th Avenue and 7th Avenue.

- *Oak Street from 19th Avenue carries 8,900 vpd.

- *Traffic on 19th Avenue is increased by 7,300 vpd to 10,800 vpd between Main Street and Oak Street.

- *Total VMT shows a slight decrease over other test runs.

Social and Environmental Impacts:

- *Additional right-of-way would be needed for 19th Avenue and new right-of-way would be needed for Oak Street from 19th Avenue to 7th Avenue.

- *The Oak Street extension requires two stream crossings and may encroach on park lands, causing a substantial environmental impact.

Test Run #10

Proposed Improvements:

- *Improve 19th Avenue from Main Street to Oak Street.

- *Construct Oak Street from 19th Avenue to 7th Avenue.

*Improve Durston Road from 19th Avenue to 7th Avenue.

*All improved or constructed segments would be two-lane with four-lane capability.

General Assignment Results:

*Traffic on 19th Avenue would increase by 7,100 vpd to 10,600 vpd between Main Street and Oak Street.

*Traffic on Oak Street extension would be 8,800 vpd.

*Traffic on Durston Road would decrease by 2,400 vpd to 1,100 vpd between 19th Avenue and 7th Avenue.

*Traffic on Main Street would decrease by 7,500 vpd to 9,500 vpd between 19th Avenue and 7th Avenue.

*Traffic on 7th Avenue would decrease by 6,600 vpd between Oak Street and Main Street.

Social and Environmental Impacts:

*19th Avenue and Durston Road would require additional right-of-way and new right-of-way would be needed for the Oak Street extension.

*The Oak Street extension requires two stream crossings, and may encroach on park lands, causing a substantial environmental impact.

Test Run #11

Proposed Improvements:

*Improve and extend Koch Street from Ferguson Road to Willson Avenue to provide a through, arterial street.

General Assignment Results:

*Traffic on Koch Street ranged from 1,000 vpd to 6,800 vpd between Ferguson Road and 19th Avenue. Between 19th Avenue and Willson Street volumes ranged from 1,000 vpd to 1,100 vpd.

*Traffic on Main Street was decreased by 3,100 vpd between Koch Street and 19th Avenue. East of 19th Avenue the decrease on Main Street was 800 vpd.

*Traffic on College Street decreased by 200 vpd to 300 vpd between West Main Street and Willson Avenue.

Social and Environmental Impacts:

*Additional right-of-way would be required on segments of Koch Street between 20th Avenue and Willson Avenue. New right-of-way would be needed from 20th Avenue west to Ferguson Road.

Test Run #12

Proposed Improvements:

*Test the E+C system, plus the following improvements:

1. Extend Durston Road from Ferguson Road to the west study area boundary.
2. Extend Babcock Road from Ferguson Road to the west study area boundary.
3. Include Stuckey Road from the west study area boundary, and extend from 19th Avenue to 11th Avenue.
4. Extend 11th Avenue from Kagy Boulevard south to intersect with South 3rd near Goldenstein Lane.
5. Extend Goldenstein Lane from the extension of 11th Avenue, west to 19th Avenue.
6. Extend College Street west from Willson Avenue to Sourdough Road.
7. Extend Fort Ellis Road from the south study area boundary, north under I-90 to intersect with the north frontage road.
8. Extend Oak Street from 7th Avenue to 19th Avenue.

General Assignment Results:

*Traffic on Durston Road increased 500 vpd to 900 vpd with corresponding decreases on Babcock Road.

*The addition of Stuckey Road along with the extension of 11th Avenue reduces traffic on 19th Avenue by 2,000 vpd to 4,800 vpd south of Lincoln Road, and on South 3rd by 600 vpd to 700 vpd south of Kagy.

*The extension of Goldenstein Lane increases traffic by 600 vpd to 1,300 vpd on this route.

*The College Street extension would carry 6,000 vpd.

*Traffic on Willson Avenue would increase by 1,300 vpd to 3,200 vpd south of College Street, and decrease by 1,300 vpd north of College Street.

*Traffic on Sourdough Road north of College Street would increase by 3,000 vpd.

*Fort Ellis Road would carry 1,600 vpd, reducing traffic on Bozeman Trail by 400 vpd to 1,400 vpd.

*The Oak Street extension results in traffic reductions on Main Street and 7th Street and Durston Road as described in other tests of this improvement.

Social and Environmental Impacts:

*Volumes on these segments could be handled within existing right-of-ways. New right-of-way would be required for the extensions of Oak Street, 11th Avenue, Stuckey Road and Goldenstein Lane.

Test Run #13B

Proposed Improvements:

*Include all improvements on Test Run #12.

*Extend 19th Avenue from Baxter Lane to I-90 and connect with an interchange.

*Close 11th Avenue at Garfield Street on the M.S.U. campus.

*Close Grant Street at 11th Avenue.

*Interchange Wallace Avenue with I-90.

*Extend Wallace Avenue from Main Street south along the C M St. P and P railroad tracks to Story Street.

*Substitute Tamarack Street for Oak Street from North 7th Avenue to Rouse Avenue.

*Extend 7th Avenue from Main to Babcock.

*Extend 8th Avenue from Main to Mendenhall.

General Assignment Results:

*The 19th Avenue interchange with I-90 would carry 2,800 vpd.

*Traffic on Baxter Lane would decrease by 3,000 vpd from 19th Avenue to 7th Avenue.

*Traffic on 19th Avenue would increase by 5,900 vpd between Oak Street and Baxter Lane, and by 15,400 vpd between Oak Street and Durston Road.

*Oak Street extension from 19th Avenue to 7th Avenue would carry 13,600 vpd.

*Tamarack Street would carry 10,900 vpd.

*The closure of 11th Avenue results in increased traffic on 7th and 8th Avenue in the vicinity of the campus of 6,500 vpd.

*Traffic on College Street increases approximately 2,800 vpd between 19th Avenue and Willson Avenue.

*Traffic on Kagy Boulevard increases by 2,000 vpd due to the closure of Grant Street.

*The Wallace Street interchange with I-90 does not load significantly.

*The 7th Avenue extension between Main and Babcock carries 10,300 vpd.

*The 8th Avenue extension between Mendenhall and Main carries 12,400 vpd.

*Traffic on Main Street west of 7th Avenue decreases by 29,500 vpd and east of 7th Avenue by 5,000 vpd.

Social and Environmental Impacts:

*Closure of 11th Avenue and Grant Street in the vicinity of the campus would result in increased pedestrian safety in the campus area, but would raise traffic volumes, noise and air pollution on streets surrounding the campus.

*Improvements to Tamarack Street would increase traffic through a residential area.

*Extension of 7th and 8th Avenues in the vicinity of Main Street will result in the taking of residential and commercial properties.

C. NETWORK PROBLEMS:

The traffic studies described in the foregoing chapters were analyzed to determine existing and future network problems.

Figure 6 shows a general overview of the network problems identified by the various traffic studies.

Ten of the 27 high accident locations are on Main Street. Ranked by accident rate, which takes into consideration the number of vehicles at a location, the five highest hazard locations are:

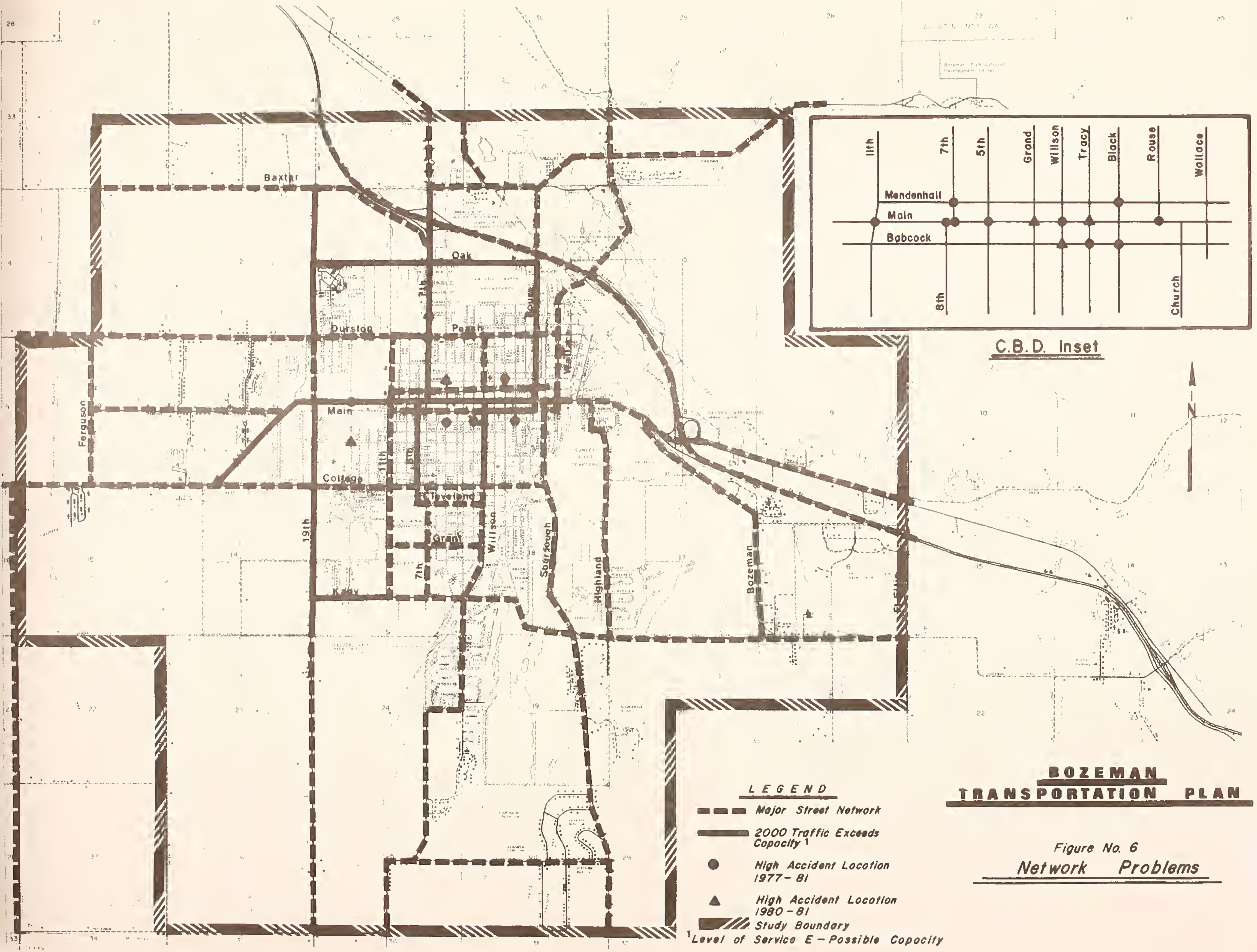
1. Olive and Grand.
2. Olive and Bozeman.
3. Black and Lamme.
4. Olive and 6th.
5. Lamme and 5th.

Only one of these locations is on the Major Street Network. The accident rates at these intersections are high due to restricted sight distance.

The links in the network where year 2000 traffic volumes will exceed the possible capacity of the street have been identified by comparing the capacity of the street based on its functional classification to the year 2000 volume on the existing and committed system.

Major recommended improvements to the Major Street Network have been tested using the traffic assignment model. The limitations of the model should also be considered in evaluating the improvements tested. The model assigns all zone to zone traffic to the shortest route between zones. This does not take into consideration diversion of traffic to other routes when the capacity of a street is reached. A good example of this is the heavy loading on Main Street where assigned volumes reached 46,000 vpd. Traffic volumes of this magnitude would cause such severe congestion that traffic flow would stop. At some point around the possible capacity of the street, traffic would begin diverting to other routes to avoid the congestion.

The model is primarily suited for testing major improvements, such as increasing travel time along the entire length of a facility, or adding new connecting links to the system. It is not suited for testing minor system improvements. These improvements were evaluated using other criteria, such as capacity of the particular location, accident experience and observation of the operational characteristics of a particular location.



BOZEMAN TRANSPORTATION PLAN

Figure No. 6
Network Problems

CHAPTER V.

RECOMMENDED IMPROVEMENTS

The recommended improvements to the Bozeman Transportation System have been set forth in four categories. These were:

Committed and Planned Improvements - Improvements on which priorities have been established, and which are included in the Policy Coordinating Committee approved project priority list for the Bozeman area.

Recommended Long-Range Improvements - Major system improvements which will require long-term commitments to planning and design.

Short-Range/Transportation System Management Improvements - Minor improvements which can be carried out by the city or county as maintenance projects or safety projects. These are cost effective improvements which can be carried out within one year.

Other Transportation System Improvements - Improvements to increase the effectiveness of other travel modes.

A. COMMITTED AND PLANNED IMPROVEMENTS

The following improvements are either committed to be constructed, or are in the planning stages.

1A Project Description - 19th Avenue - Reconstruct from Babcock Street to Durston Road.

Project Number - M 1201(1)
Project Length - 0.5 miles
Approvals - TAC, PCC
Tentative Contract Date - Bid let January - 1982
Estimated Cost - $1,156,000
Type of Funds - Urban

2A Project Description - Kagy Boulevard - Reconstruct from Highland Boulevard to Willson Avenue.
Project Number - M 1212(1)
Project Length - 1.1 miles
Approvals - TAC, PCC
Tentative Contract Date - Fiscal year 1983
Estimated Cost - $2,480,000
Type of Funds - Urban

3A Project Description - Kagy Boulevard - Reconstruct from Willson Avenue to 19th Avenue.
Project Number - M 1212(4)
Project Length - 1.0 miles
Approvals - TAC, PCC
Tentative Contract Date - Beyond 1987
Estimated Cost - $2,280,000
Type of Funds - Urban

4A Project Description - New Construction - Construct Oak Street from Rouse Avenue to North 7th Avenue.
Project Number - M 1202(1)
Project Length - 0.8 miles
Approvals - TAC, PCC
Tentative Contract Date - Beyond 1987
Estimated Cost - $1,473,000
Type of Funds - Urban

5A Project Description - 19th Avenue - Construct from Durston Road to Oak Street,
Project Number - M 1201
Project Length - 0.5 miles
Approvals - TAC, PCC
Tentative Contract Date - Beyond 1987
Estimated Cost - $1,245,000
Type of Funds - Not programmed

6A Project Description - Oak Street - Construct from 19th Avenue to North 7th Avenue.
Project Number - M 1202
Project Length - 0.8 miles
Approvals - TAC, PCC
Tentative Contract Date - Beyond 1987
Estimated Cost - $1,633,300
Type of Funds - Not Programmed

7A Project Description - Highway 191- Reconstruct to four-lane with limited access from existing four-lane to 9.0 miles west.
Project Number - F 50-2(4)79
Project Length - 9.0 miles
Approvals - N/A
Tentative Contract Date - Beyond 1987
Estimated Cost - $5,823,000
Type of Funds - Primary

8A Project Description - Main Street - Overlay from North 7th Avenue to Wallace Avenue.
Project Number - FR 50-2(9)89
Project Length - 0.8 miles
Approvals - TAC, PCC
Tentative Contract Date - May - 1982
Estimated Cost - $265,000
Type of Funds - Primary 3R

9A Project Description - North 7th Avenue and Griffin Drive - Improve intersection, add turn bays, curbs and lighting.
Project Number - HES 205-1(3) MP 28 02
Project Length - N/A
Approvals - TAC, PCC
Contract Date - Let to contract September - 1981
Estimated Cost - $213,416
Type of Funds - Safety

10A Project Description - Bridger Drive and Griffin Drive - Improve intersection, new bridge and approaches.
Project Number - F-HES 86-1(2) MP 1
Project Length - N/A
Approvals - TAC, PCC
Tentative Contract Date - FY 1982
Estimated Cost - $642,000
Type of Funds - Safety ($247,000) and Primary ($395,000)

11A Project Description - Goldenstein Lane - New bridge and approaches - bid let June 1982.
Project Number - SOS - 16(5)
Project Length - 0.2 miles
Approvals - N/A
Tentative Contract Date - FY 1982
Estimated Cost - $286,133
Type of Funds - Safer offsystem.

B. SHORT RANGE/TRANSPORTATION MANAGEMENT IMPROVEMENTS

The following improvements are recommended to improve the operation of the existing street network.

1B Project Description - North 7th Avenue and Durston Road - Provide a right turn lane on the north leg by prohibiting parking and striping. Designate lanes with overhead signs.

Justification - There has been a high number of accidents at this location involving vehicles making a right turn, with vehicles using the parking lane for a right turn. Turning movement counts show 23% of the evening peak hour traffic making a right turn from the north leg of 7th Avenue onto Durston.

Estimated Cost - $2,250.

Type of Funds - Safety.

2B Project Description - Olive Street - Remove parking, sign and paint curb at the following locations: (See Fig. 7&8).

Olive and Bozeman - all corners.
Olive and 6th - all corners.
Olive and Grand - all corners.
Olive and Willson - all corners.

Justification - High number of angle accidents at these locations, due to restricted sight distance.

Estimated Cost - $3,200.

Type of Funds - Safety or city maintenance funds.

3B Project Description - Mendenhall - Remove parking sign and paint curb at the following locations: (See Fig. 7&8).

Mendenhall and Willson - Southeast and Northeast corners.
Mendenhall and Black - Southeast and Northeast corners.
Mendenhall and Tracy - Southeast and Northeast corners.
Mendenhall and Bozeman - Southeast and Northeast corners.

Justification - High number of angle accidents at these locations, due to restricted sight distance.

Estimated Cost - $1,600.

Type of Funds - Safety or city maintenance.

Figure No. 7

TYPICAL PARKING LAYOUT

Non-Signalized Intersection

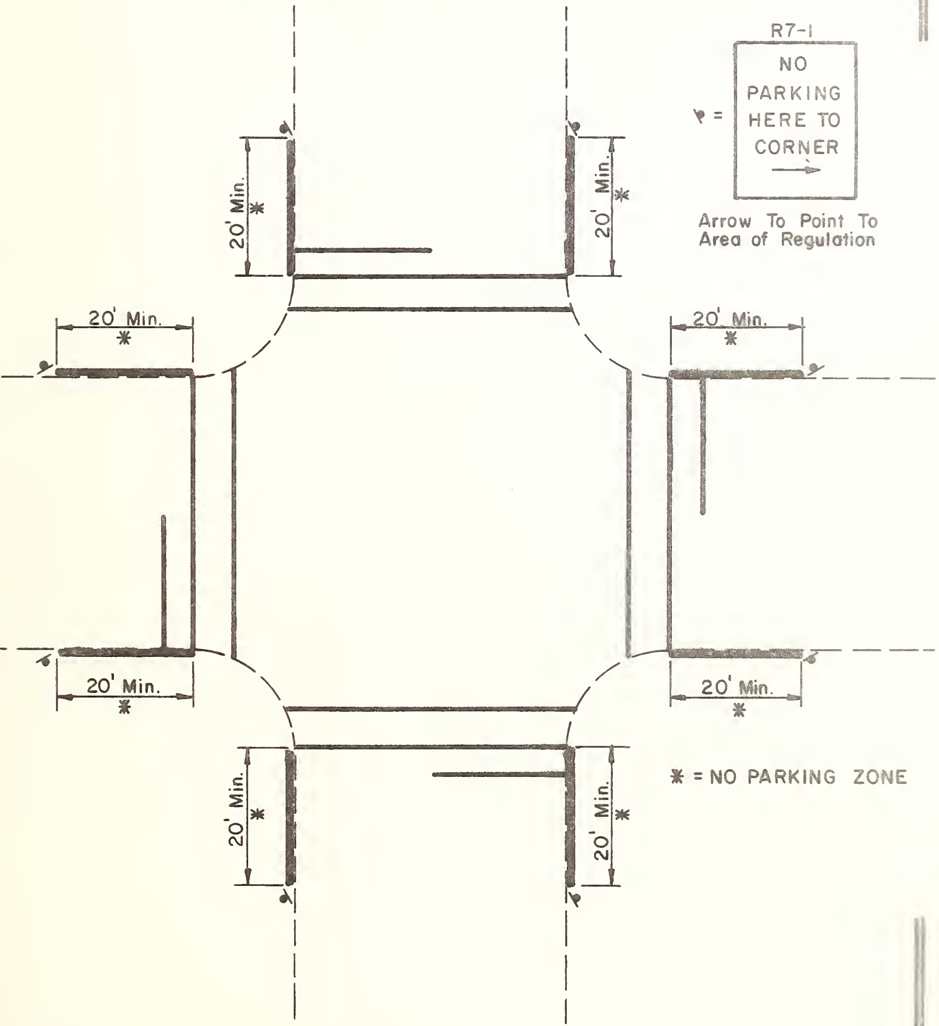
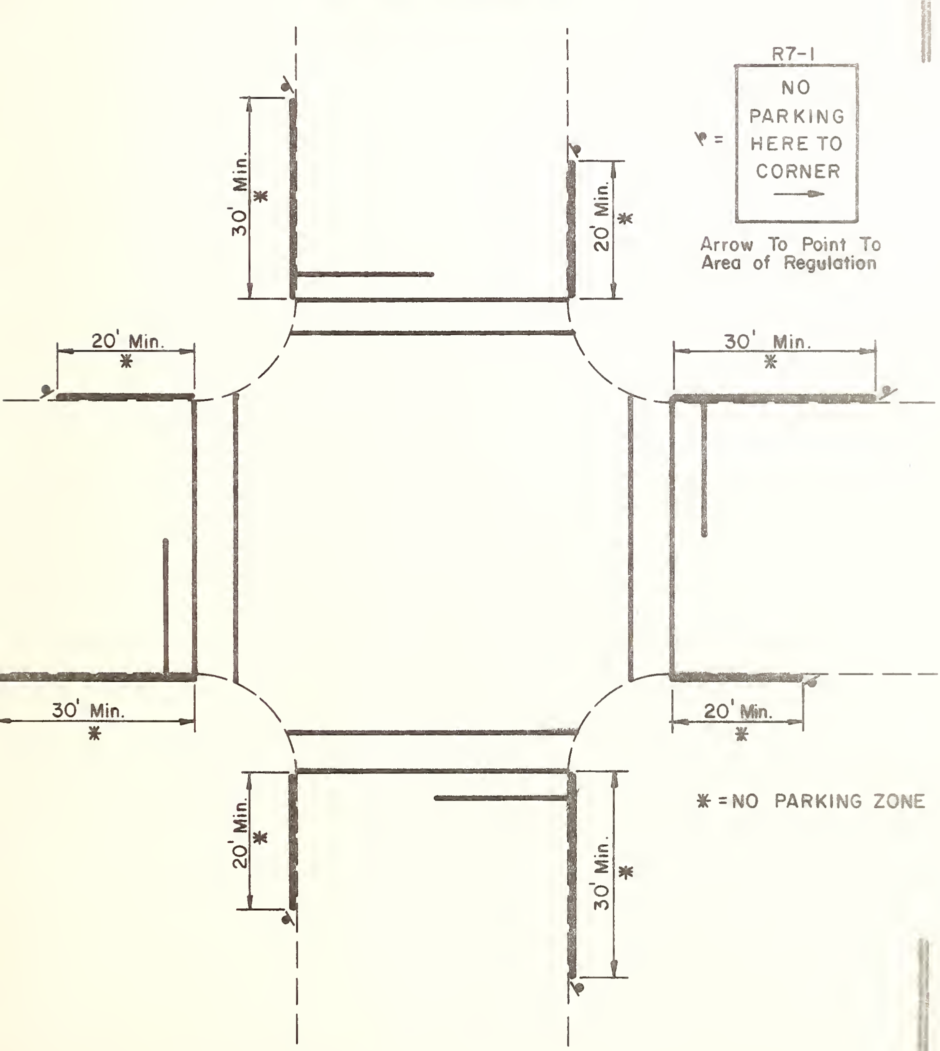


Figure No. 8

TYPICAL PARKING LAYOUT

Signalized Intersection



4B Project Description - Lamme Street - Remove parking, sign and paint curb at the following locations: (See Fig. 7&8).

Lamme and Black - All corners.
Lamme and 5th - All corners.

Justification - High number of accidents at these locations, due to restricted sight distance.

Estimated Cost - $1,600.

Type of Funds - Safety or city maintenance funds.

5B Project Description - Babcock - Remove parking, sign and paint curb at the following locations: (See Fig. 7&8).

Babcock and Tracy - Southwest and Northwest corners.
Babcock and 11th - Southwest and Northwest corners.
Babcock and Bozeman - Southwest and Northwest corners.

Justification - High number of accidents at these locations, due to restricted sight distance.

Estimated Cost - $1,600.

Type of Funds - Safety or City maintenance funds.

6B Project Description - Babcock Street - extend one-way operation to 11th Avenue.

Justification - The two streets in a one-way couplet should have a common terminus so the couplet forms a loop system. This will increase the operational efficiency of the couplet, and will help to relieve congestion on Main Street between 11th and 8th Avenues within the existing street section. Remove parking from one side.

Estimated Cost - $3,900.

Type of Funds - Urban

7B Project Description - Extend the Babcock-Mendenhall couplet from Rouse Avenue to Wallace Avenue.

Justification - This improvement would reduce the heavy left turn movement from the south leg of the intersection of Rouse Avenue and Mendenhall Street (currently 48% of the total peak hour traffic). It would also decrease congestion at the Rouse and Babcock and Rouse and Main intersections.

Estimated Cost - $5,200.

Type of Funds - Urban. (Requires adding these systems to Federal and Urban systems.)

8B **Project Description** - Eleventh and Main - Provide a right turn bay from 11th to Main. (See Figure 9).

Justification - During the evening peak hour, 59% of the traffic on the north leg of this intersection turned right from 11th Avenue to Main.

Estimated Cost - $2,250

Type of Funds - Safety or city maintenance.

9B **Project Description** - Seventh and Main - Remove parking on east leg, and provide a right turn bay from Main to 7th Avenue. (See Figure 9).

Justification - During the evening peak hour, 17% of the traffic on the east leg of this intersection turned right onto 7th Avenue.

Estimated Cost - $2,250.

Type of Funds - Safety or primary.

10B **Project Description** - Rouse and Main - Remove parking on south leg, and provide left turn, through and right turn lanes. (See Figure 10).

Justification - During the evening peak hour there are 16% left turns and 22% right turns from the south approach to this intersection.

Estimated Cost - $2,250.

Type of Funds - Urban.

11B **Project Description** - Fifteenth and Main - Remove parking on the east leg of the intersection, and provide a right turn lane from Main onto 15th Avenue. (See Figure 9) .

Justification - Heavy right turn movement from Main and 15th Avenue.

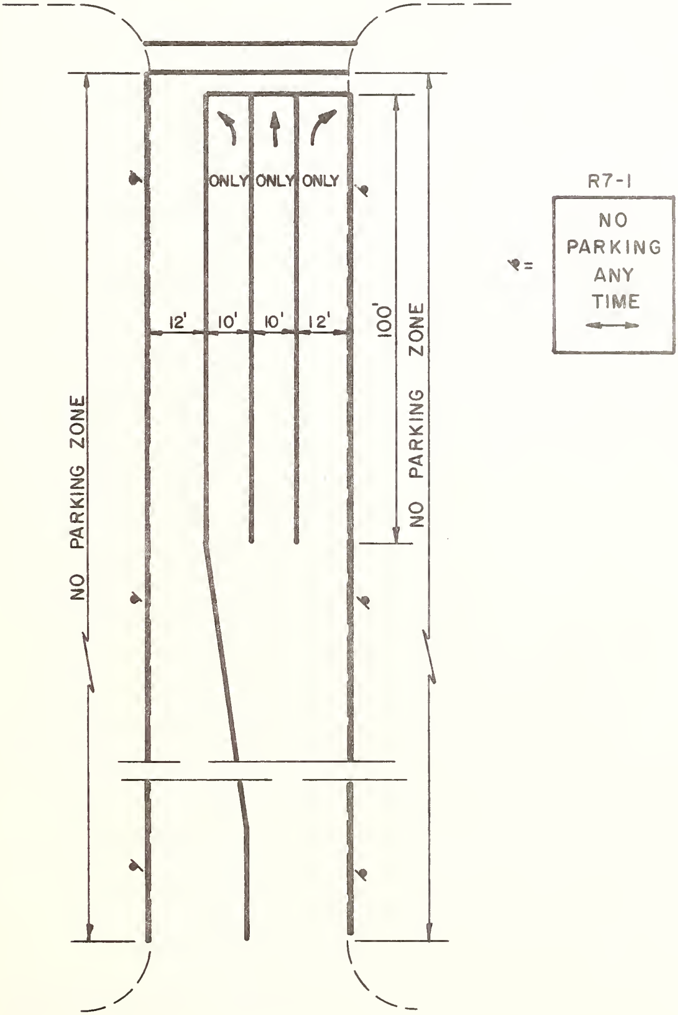
Estimated Cost - $2,250.

Type of Funds - Primary.

12B **Project Description** - Truck Route Signing - Install signs at Jackrabbit Lane and preceding 7th and Main, directing trucks to I-90. Develop a truck route system based on local truck and through truck movements, and sign select streets, prohibiting through truck traffic. Refer to Project Description #16.

Figure No. 9

TYPICAL MARKINGS FOR TURN BAYS
(44' Street)



Justification - The truck survey indicated that some trucks on Main Street were confused on how to reach I-90. Signs at Jackrabbit Lane and U.S. Highway 191, and preceding Main and 7th, will guide trucks to I-90 before reaching downtown Bozeman.

Estimated Cost - $1,000.

Type of Funds - Primary and urban.

13B Project Description - Fifteenth and Main - Redesign access on north approach to relieve congestion caused by turning movements.

Justification - The access to McDonald's on the North approach interferes with the operation of the intersection.

Estimated Cost - $1,000.

Type of Funds - Safety or city.

14B Project Description - Seventh and Durston - Redesign access on west approach to relieve congestion, and to reduce accidents.

Justification - The access from Durston Road to the IGA Market interferes with the operation of the intersection. There is a high accident rate at this location.

Estimated Cost - $1,000.

Type of Funds - Safety or city.

15B Project Description - Signal Maintenance Program - Conduct a detailed analysis of existing signal system to determine optimum timing. Establish a periodic evaluation program.

Justification - Traffic signal timing plan optimization is the most cost effective improvement that can be made to the traffic control system. Average cost per intersection is $300 to $400 annually. Studies have shown that each dollar spent results in 21 to 29 gallons of fuel savings.[1]

Estimated Cost - $6,000 per year.

Type of Funds - Primary and urban

16B Project Description - Truck Route Designation - Establish truck routes in the Bozeman area and sign.

Justification - An urban signing project should be initiated to sign specific truck routes. The preliminary engineering of the project should include an analysis of local and through truck traffic to determine the routes to be signed.

Estimated Cost - $15,000.

Type of Funds - Primary and urban.

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[1] Energy Impacts of Urban Transportation Improvements, Institute of Transportation Engineers, 1980

17B Project Description - Pedestrian Safety Plan and improvements.

Justification - The Pedestrian Traffic Safety Committee has set forth a number of suggested improvements to increase pedestrian safety. Funds were not available to conduct a comprehensive study of pedestrian safety as part of the Transportation Plan. A comprehensive study should be conducted so improvement priorities can be established.

Estimated Cost - $10,000 (planning) - Total cost to be determined when improvements are identified.

Type of Funds - Urban.

C. RECOMMENDED LONG RANGE IMPROVEMENTS

The following major improvements are recommended, based on year 2000 traffic assignments on the existing and commited Main Street Network:

1C Project Description - Seventh Avenue - extend from Main Street South to connect with Babcock Street.

Justification - This connection will transfer eastbound traffic to the Central Business District from Main Street to Babcock, which is now operating below capacity. This connection, along with the extension of Babcock to 19th Avenue, will also reduce the heavy left turn movement from the west leg of Main and 7th onto 7th Avenue. (Presently 40% of the total evening peak hour traffic is on this approach).

Estimated Cost - $505,000.

Type of Funds - Urban. (Would require adding to the Urban System).

2C Project Description - Eighth Avenue - Extend from Main Street north to connect with Mendenhall Street (See Figure 10).

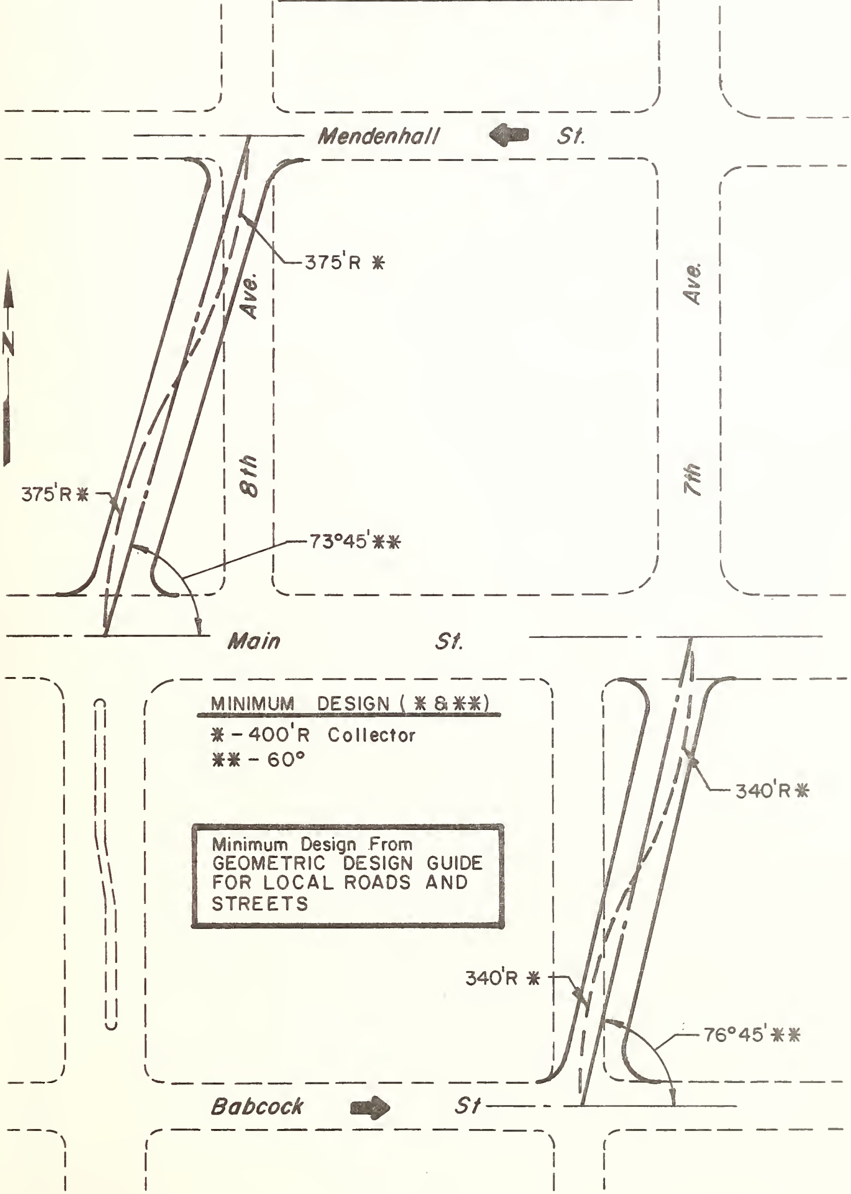
Justification - This connection provides improved access for southbound traffic destined to the MSU campus by eliminating the left turn from Main to 8th. Southbound traffic on 7th would make a free right left turn from Mendenhall to 8th, and straight through the signal at 8th and Main. This route would relieve traffic on 11th, which is recommended to be closed at the MSU campus.

Estimated Cost - $330,000.

Type of Funds - Urban (would require adding to Urban System).

Figure No. 10

7th & 8th Ave. Extensions



3C Project Description - College Street - Reconstruct from U.S. 191 to 11th Avenue. Widen to 44 feet with sidewalks.

Justification - Year 2000 volumes on this section will reach 11,100 vpd. There is presently heavy pedestrian and bicycle traffic on this street, which can be expected to increase as the MSU campus and residential developments expand to the west.

Estimated Cost - $520,000.

Type of Funds - Urban.

4C Project Description - College Street - Extend from Willson Avenue to Church Avenue. Construct to 44' width with curb and gutter.

Justification - This link carries 6,600 vpd in the year 2000. It provides an additional eastwest route to the MSU campus area between Kagy Boulevard and Main Street.

Estimated Cost - $261,000.

Type of Funds - Urban.

5C Project Description - South 3rd - Reconstruct from Kagy Boulevard to vicinity of Graf Street. Widen to 44 feet, 2-12 foot driving lanes, with 10-foot shoulders.

Justification - Residential growth in this area will result in traffic volumes of up to 8,400 vpd by the year 2000. Currently there is a large volume of pedestrian and bicycle traffic on this street section.

Estimated Cost - $880,000.

Type of Funds - Urban (Would require adding to Urban System).

6C Project Description - Stuckey Road - Improve Stuckey Road from South 19th Avenue to Cottonwood Road.

Justification - As residential growth occurs in this area, this roadway should be upgraded as a major collector. Traffic volumes on this road will reach 2,700 vpd by 2000, which will require surface and drainage improvements.

Estimated Cost - $240,000.

Type of Funds - Improvements should be phased as the area develops. Fund by R.I.D. to be paid by property owner(s).

7C Project Description - Bozeman Trail Road and Fort Ellis Road from Haggerty Lane to the North Frontage Road on I-90. Surface and drainage improvements.

Justification - As development in this vicinity takes place, traffic volumes will continue to increase on these unpaved sections, reaching up to 1,900 vpd by 2000.

Estimated Cost - $426,000.

Type of Funds - Urban, county or local.

8C Project Description - Nineteenth Avenue - Reconstruct from Oak Street to I-90. Construct an interchange at I-90.

Justification - As development occurs along the 19th Avenue Corridor, extending from I-90 to the area south of the MSU campus, 19th becomes an increasingly important north-south arterial. The closure of 11th Avenue at the campus, and increased traffic on south 8th and north 7th Avenues are system problems which can be alleviated by providing a direct north-south route to the campus areas and areas south of campus. Year 2000 traffic volumes of up to 8,500 vpd are projected for this route.

Estimated Cost - $2,900,000.

Type of Funds - No funds currently available, possibly Interstate 4R funds in future.

9C Project Description - Nineteenth Avenue - Reconstruct to four-lane from Stuckey Road to Main Street.

Justification - Continued development south of the MSU campus and the proposed closure of 11th at the MSU campus will cause traffic on this street section to increase to as high as 23,800 vpd by 2000. This exceeds the capacity of the existing street.

Estimated Cost - $2,490,000.

Type of Funds - Urban.

10C Project Description - Eleventh Avenue and Grant Street - Close to through traffic in the vicinity of the MSU campus. Closure design and location of the closures should be based on the Campus Development Plan.

Justification - Pedestrian crossings along the length of these streets within the campus have caused the streets to function as local access facilities rather than part of the arterial system. Alternate concepts, including grade-separated pedestrian crossings, have been evaluated, but are not feasible.

Estimated Cost - $10,000
Type of Funds - Urban, campus development funds.

11C Project Description - Eighth Avenue - Reconstruct from Main Street to Cleveland.
Justification - This street will continue to deteriorate, due to drainage and maintenance problems. With the closure of 11th Avenue at the MSU campus, and the connection of 8th Avenue to Mendenhall Street, 2000 traffic volumes will be 12,700 vpd, approaching a four-lane capacity.
Estimated Cost - $720,000.
Type of Funds - Urban (Requires adding two blocks to the Urban System).

12C Project Description - Durston Road - Reconstruct from 19th Avenue to 7th Avenue. Widen to 44 feet, two lands with 10-foot shoulders, left-turn bays at 19th and 7th Avenues.
Justification - Current traffic is nearing the capacity of the street. Improvements to 19th Avenue from Durston Road to Oak Street, and on Oak Street from 19th Avenue to 7th Avenue, will alleviate some of the traffic impact on this route.
Estimated Cost - $800,000.
Type of Funds - Urban.

13C Project Description - Babcock - Improve from 11th Avenue to 19th Avenue.
Justification - Development in the area west of 19th Avenue will place an increasing amount of traffic on this section. Year 2000 volumes of up to 5,800 vpd are projected.
Estimated Cost - $720,000.
Type of Funds - Local.

14C Project Description - Willson Avenue - Grand Avenue - Convert to a one-way couplet between Lincoln Street and Cottonwood Street.
Justification - Year 2000 traffic on Willson Avenue will reach volumes as high as 16,000 vpd. When volumes approach 12,000 vpd, consideration should be given to converting Willson Avenue to one-way north-bound, and Grand Avenue to one-way south-bound.
Estimated Cost - $44,300.
Type of Funds - Urban (requires adding Grand to the Urban System).

15C Project Description - Olive - Lamme Streets - Convert Olive Street to a one-way street west-bound, and Lamme Street to one-way east-bound from 11th Avenue to Wallace Avenue.

Justification - This conversion should be made in phases. Olive and Lamme Streets should be made through streets initially. Following completion of improvements to the Babcock-Mendenhall couplet, the two streets should be converted to one-way operation. As traffic volumes increase on the Babcock-Mendenhall couplet, Lamme and Olive will require one-way operation to reduce around-the-block travel.

Estimated Cost - $32,400.
Type of Funds - Urban (Requires adding these streets to the Urban System).

16C Project Description - Highland Boulevard - Reconstruct to a wide two-lane roadway from Kagy Boulevard to East Main Street providing for a staged construction to four-lane when traffic volumes warrant.

Justification - This route is a major link in the long-range arterial loop, consisting of Highland Boulevard, Kagy Boulevard, 19th Street and Oak Street.

Estimated Cost - $1,500,000
Type of Funds - Urban

D. OTHER TRANSPORTATION IMPROVEMENTS

1. Parking:

A detailed parking study was beyond the scope of this planning project; however, the parking analysis made, based on trip generation in the Central Business District, shows a shortage of 296 short term parking spaces. Several of the short range improvement recommendations require removal of parking to provide increased intersection sightdistance.

A well-located, downtown parking space contributes from $15,000 to $20,000 annually in retail sales.[1] It is essential for downtown Bozeman to maintain adequate parking. Strict enforcement of parking regulations will help to make short term spaces available for shoppers and persons conducting business in the C.B.D. Employees should be encouraged to use fringe parking spaces, freeing the short term spaces for customers.

Planning should be initiated to develop additional short term parking in the area bounded on the north by Mendenhall, east by Rouse, south by Babcock and west by 5th Avenue.

Additional parking can be financed by a parking special improvement district, or by tax increment financing, if this concept is approved by the City Commission.

2. Pedestrian/Bicycle Facilities:

Recommended improvements on South 3rd, College Street and Durston Road include pedestrian facilities. Design of all street improvements should take into consideration pedestrian and bicycle traffic in the area.

The Bikeway Plan establishes major routes to be designated as bicycle routes. The C.M. and St. P and P Railroad right-of-way has been included in this plan. The acquisition, improvement and maintenance of this route will require citizen participation due to the lack of municipal funds for this purpose. The opportunity to acquire property which is suited for a linear park concept, such as this land, will not come again.

The Department of Natural Resources and Conservation funded the Bikeway Plan. Additional funds may be available for detailed planning of the bicycle system, in particular the exclusive bikeway/walkway on the railroad right-of-way.

3. Ridesharing:

Montana State University should encourage carpooling by providing matching services and preferential parking.

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[1] Source: Transportation and Parking for Tomorrow's Cities, Wilbur Smith and Associates, 1966

Vanpooling may become more attractive if state legislation is passed which would allow van owners to charge passengers without complying with P.S.C. regulations. This would make it possible for a student to pay for the vehicle by carrying passengers.

4. Mass Transit:

Mass transit operation generally is not self-supporting. State legislation has been passed allowing transit districts to be formed for the purpose of levying up to 12 mills for transit service.

In February 1980, TAC opted not to apply for transit-planning funds. Cutbacks in federal funding would place a greater burden on local funding sources. At the present time there is no strong interest in establishing a mass transit system in Bozeman.

E. OTHER CONSIDERATIONS

1. Energy:

The Bozeman Comprehensive Plan has an energy component which sets forth an energy conservation plan for the Bozeman area.

The transportation system results in the direct consumption of energy by vehicle use and indirect energy use in building and maintaining the system.

The Transportation Plan places a heavy emphasis on low-cost operational improvements which will be cost-effective in reducing energy consumption by reducing traffic congestion and decreasing travel times throughout the system. A recent study[1] shows that, nationwide, 1.8 billion gallons of gasoline could be saved by traffic signal system improvements. Expansion of ridesharing could save up to .5 billion gallons of gasoline.

Major improvements which have been recommended require substantial commitments of resources and energy to implement. Facilities which have been recommended for new construction or reconstruction are projected to carry traffic volumes approaching the design capacity of the proposed improvement by the year 2000. These facilities will contribute to the efficiency of the transportation system, and result in a net energy savings over the life of the facilities.

2. Air Quality:

The recommended system improvements will generally improve the air quality compared to the air quality which would exist without the improvements. The improvements recommended for 19th Avenue from the South study

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[1] Energy impacts of Urban Transportation Improvements, Institute of Transportation Engineers.

area boundary to I-90, and on Oak Street from 19th Avenue to Rouse Avenue, will result in a lower air quality along these corridors, due to construction of new facilities. However, traffic congestion will be reduced along the 7th Avenue and Main Street corridors, resulting in a net air quality improvement for the urban area.

Short range improvements will result in air quality improvement over future air quality if the present operation is continued. Vehicle delays will be reduced and travel times will be shortened.

3. President's Urban Policy:

The development of the Bozeman Transportation Plan has been carried out with consideration given to the President's Urban Policy, which was set forth in a White House memorandum to the Secretary of Transportation on August 2, 1979. The five policy objectives from that memorandum were adopted by the Department of Transportation. The objectives which were followed in developing the Plan are:

a. Urban Impact:

Recommended improvements to improve traffic access, circulation and parking in the Central Business District will compliment downtown improvements which have taken place, or are planned.

Most of the recommended improvements to the downtown circulation system are operational improvements which will utilize existing streets.

b. Energy Conservation:

As stated in Section D-1, Chapter V., the Plan emphasizes cost-effective improvements which will result in a net energy savings.

Recommended parking improvements in the core area will also result in less around-the-block travel in search of a parking space.

c. Minority and Neighborhood Effects:

Four of the recommended improvements will require right-of-way acquisition. Two of these, the extension of 7th and 8th Avenues, pass through developed areas, requiring displacement of existing businesses and/or residential structures. The total impact will not be known until a final alignment is determined. The design should minimize the impact while providing an adequate facility to meet future traffic demands. No identified minority neighborhoods are impacted.

d. Improvements to Existing Systems:

All but four recommended improvements are on existing facilities. The Plan emphasizes the use of the existing systems with cost-effective modifications.

e. Consideration of Alternatives:

A total of 13 traffic assignment were made to test alternative improvements. Those improvements that would most effectively meet future traffic needs while minimizing the cost, are recommended.

4. Environmental Impacts:

Several of the proposed projects require new construction and will require right-of-way acquisition. When these projects progress into the preliminary engineering stage, it will be determined if a complete environmental impact statement will be required. The impact of the project on land use, vegetation and aesthetics, fish, wildlife, archeology, geology, public facilities, existing neighborhoods, social and economic structure, noise, drainage, flood plain, wetlands and water quality will all be taken into consideration before construction begins.

5. Elderly and Handicapped:

Design of the proposed projects will take into consideration the special transportation needs of the elderly and the handicapped.

6. Equal Employment Opportunity:

The construction of the proposed projects will be carried out in compliance with the applicable federal, state and local laws relating to equal employment opportunity, affirmative action and non-discrimination in public services.

CHAPTER VI.

FUNDING

A. EXISTING SOURCES AND CATEGORIES

The establishment of a funding schedule for planned transportation improvements is the most uncertain part of the Transportaiton Plan. Travel and traffic patterns can be estimated, based on predictions of future growth and development. The collection and distribution of funds for transportation improvements undergo minor changes on a regular basis, making it nearly impossible to estimate funding availability for a period longer than two to three years, and at the outside, five years. An example of this fluctuation in available transportation system improvement funds is the recent cutbacks in federal monies which have resulted in major reductions in personnel and planned projects at the state level. A number of federally funded programs, such as Urban Mass Transit grants, Highway Traffic Safety funds, and other special funding categories undergo annual reviews at the federal level which could result in termination of the programs with no alternate programs to provide assistance at the local level.

Two of the major factors affecting the federal and state funding of transportation improvements are:

Fluctuations in fuel prices cause fluctuations in the number of miles traveled on the highway system. High fuel costs, which usually occur simultaneously with increased construction costs, result in a decrease in fuel taxes available to carry out highway improvements.

* Energy Costs - Congress has tended to react to higher energy costs by funding programs for alternate transportation modes, such as mass transit. Although the future of the mass transit program at the current funding level is in doubt, substantial portions of the highway fund have been used by this program in the larger urban areas.

* National Economy - The current status of the nation's economy is resulting in cutbacks in most federal programs.

The following funding sources are currently available for

transportation improvements:

1. Federal Interstate:

   These funds are currently earmarked for the completion of the Interstate System. The states are required to match these funds at approximately a 90 federal - 10 state ratio.

   Interstate funds are then distributed to the state highway financial districts, based on the cost of completing the Interstate System in each district. District #10 Interstate is complete, so there are no funds available from this source.

2. Federal Interstate Rehabilitation:

   Deterioration of the Interstate System has resulted in the establishment of a program to provide funds for the rehabilitation of the existing system. Interstate rehabilitation project priorities are established by the Montana Department of Highways, subject to approval by the Federal Highway Administration.

   Continued growth and development of communities adjacent to the Interstate System has made it feasible to use the system as an area transportation link, rather than constructing new parallel facilities. This utilization will require additional access points. Congress is currently considering the inclusion of reconstruction projects within this funding category, which could be a funding source for two of the recommended projects in the plan which involve the Interstate System.

3. Federal Primary:

   Federal primary highway funds are available to the state on a matching basis. These funds can be used only on the Federal Aid Primary System. Funds are apportioned to each highway financial district, based upon the ratio of the deficient mileage in the district to the total state deficient mileage. Priorities for each district are established by the Montana Department of Highways with concurrence of the Highway Commission.

   The Bozeman Financial District (#10), currently has a balance of $4,041,000, and is accumulating primary funds at a rate of approximately $2,000,000 per year. The Bozeman West project, widening U.S. Highway 191 to four lanes, will be funded by this program.

4. Federal Rural Secondary:

   These funds are available on a matching basis for improvements to the Federal Aid Secondary Highway System. The funds cannot be used within Federal Aid Urban areas. The funds are apportioned to the financial

district and then to the county, based on a number of factors, including land area, population, road mileage and land value. Project priorities are established by the County Commissioners, subject to approval by the Montana Department of Highways.

As of October 1, 1981, Gallatin County had a balance of $913,000 in this fund, and is accumulating funds at the rate of approximately $276,000 per year.

5. Federal Urban:

The funds are available, on a matching basis, for improvements on the Federal Aid Urban System. These funds are distributed to cities having a population of 5,000 or over, on a basis of population within the urban boundary. In Bozeman, improvement priorities are recommended by the Policy Coordinating Committee (members are listed in the front of this report).

The current balance in this fund is $1,599,000, excluding $1,156,000, which is committed for the construction of 19th Avenue from Main Street to Durston Road. This fund is accumulating at a rate of approximately $259,000 per year.

6. Safer Off-system Roads:

This program funded safety improvements on public roads not on a federal aid system. The funds are allocated and priorities established on the same guidelines as secondary road funds.

The new bridges on Goldenstein Lane is being funded by this program (cost - $286,133). It is unlikely there will be future funds available through this program.

7. Highway Safety Funds:

These funds are available for safety projects on the Federal Aid System. Projects are evaluated on a basis of accident reduction, hazard reduction and cost-benefit.

Intersection improvements at 7th and Griffin Drive, and at Bridger Drive and Griffin Drive are being funded through this program.

8. Urban Mass Transit:

Matching funds are available for planning and purchasing equipment to establish a mass transit system through regional or metropolitan planning agencies. The matching ratio is 80 federal - 20 local for planning and capital equipment, and 50-50 for operational costs.

Funds are also available for providing transportation services to the elderly and handicapped. The matching ratio for this program is also 80 federal - 20 local.

These funds are available through the State Commerce Department.

9. City and County Funds:

Gasoline Tax revenue collected by the state is allocated to the cities and counties for maintenance and repair of municipal and county streets and roads. These funds are supplemented by city and county mill levies. The City of Bozeman received an allocation of $154,210, and Gallatin County received $83,643 in Gasoline Tax revenue for the fiscal year beginning July 1, 1981. These funds are used primarily for maintenance of the street and road system.

Other possible funding sources at the local government level are:

* S.I.D. and R.I.D. (Special and Rural Improvement Districts). This funding method allocates improvement costs to the property owner adjacent to the facility to be constructed. Annual assessments are made to pay off the improvement bonds. Major drawbacks with this type of financing are the determination of assessments for off-site roadway improvements and default of payment by property owners.

* County Gas Tax - Some counties have explored the possibility of levying a county gas tax; however, due to citizen opposition, no Montana county has proceeded past the discussion stage of this type of financing. In 1979, a total of 31,018,844[1] gallons of gasoline was sold in Gallatin County. Of this total, 22,554,345 gallons were sold in Bozeman. Based on these figures, a 1¢ per gallon gas tax would provide Gallatin County with $310,188 annually, of which $225,554 would be Bozeman's share. This is approximately equal to the current annual urban fund accumulation for Bozeman.

* Tax increment - Tax increment financing is available to a state municipality. A city may develop an urban renewal plan which can be financed by funds raised by freezing the current tax base of a designated area, and allocating future tax increases from the area to improvements to public facilities in the designated area.

[1] Source: Montana Petroleum Association. Figures do not include aviation and jet fuel; however, non-taxable or fully refunded fuels that are difficult to determine are included.

This method of financing has been used in Great Falls, Kalispell, Missoula and Helena. Funds raised by this method can be used to improve transportation facilities within the designated area.

The Bozeman City Commission recently rejected this type of financing for the downtown area due to citizen opposition.

10. Pedestrian/Bicycle Facilities:

These facilities are funded in conjunction with improvements to all Federal Aid Systems. There should be a growing emphasis on these types of facilities, because of the interest of all age groups in physical fitness and energy conservation. These trends are especially noticeable in Bozeman. Many college students depend on walking and bicycling as primary modes of transportation.

The State Department of Natural Resources, Conservation Bureau, recently funded a planning project for a bicycle route plan. Additional funds may be available for detailed planning and preliminary design of the system. The development of the bikeway plan has been set as a goal during the transportation planning process; however, the development of the system will require 1) additional financing, and 2) improvements to the transportation network in some areas where it is not physically possible to provide for the bikeway as shown on the Bikeway Plan.

11. Ridesharing:

Funds may be available from the State Department of Natural Resources for carpool matching at major employment centers. The M. S. U. campus should explore the feasibility of a carpool program, which would reduce traffic in the campus area and reduce parking demands. These programs have been successful when:

1) Parking for carpools is given preferential treatment;

2) Carpooling is encouraged and supported by the employer;

3) The potential carpooler is made aware of fuel and vehicle operation cost savings.

Table 10 shows estimates of federal and state funds which will be available for the 1983 to 2000 planning period.

TABLE 10

ESTIMATED ANNUAL ALLOCATIONS OF STATE AND FEDERAL FUNDS

1983 - 2000

FUND CATEGORY

YEAR	PRIMARY	RURAL SECONDARY	URBAN
Current Balance October-1981[4]	$ 4,041,000	$ 913,000	$1,599,000[1]
FY 1983	1,908,000	276,000	259,000
FY 1984	2,035,000	276,000	259,000
FY 1985	2,035,000	276,000	259,000
FY 1986-2000	2,035,000	221,000	222,000
TOTAL 1983-2000	$40,544,000[2]	$5,056,000[3]	$5,706,000

[1] Does not include cost of 19th Avenue project.

[2] Balance for entire financial district.

[3] Balance for entire county.

[4] Beginning Fiscal Year 1982

CHAPTER VII.

PROJECT FUNDING PLAN

A. PROJECT SUMMARY:

Table 11 summarizes and generally rates the recommended improvements. Four factors have been used to rate each improvement:

1) Cost - The total estimated cost for each improvement is shown. For improvements involving roadway segments, the cost per vehicle mile of travel per day has been calculated.

2) Traffic Impact - For segments of roadway, the year 2000 traffic has been used to calculate daily vehicle miles of travel on the segment.

3) System Impact - This factor is rated from 0 to 3, depending on the number of the following descriptions the improvement meets.

    a. Improvement is on a facility where capacity will be exceeded by the year 2000.

    b. Improvement completes a major link in the street network.

    c. Improvement is at a high accident location.

4) Social, Economic and Environmental (SEE) Impact. This factor is rated as follows:

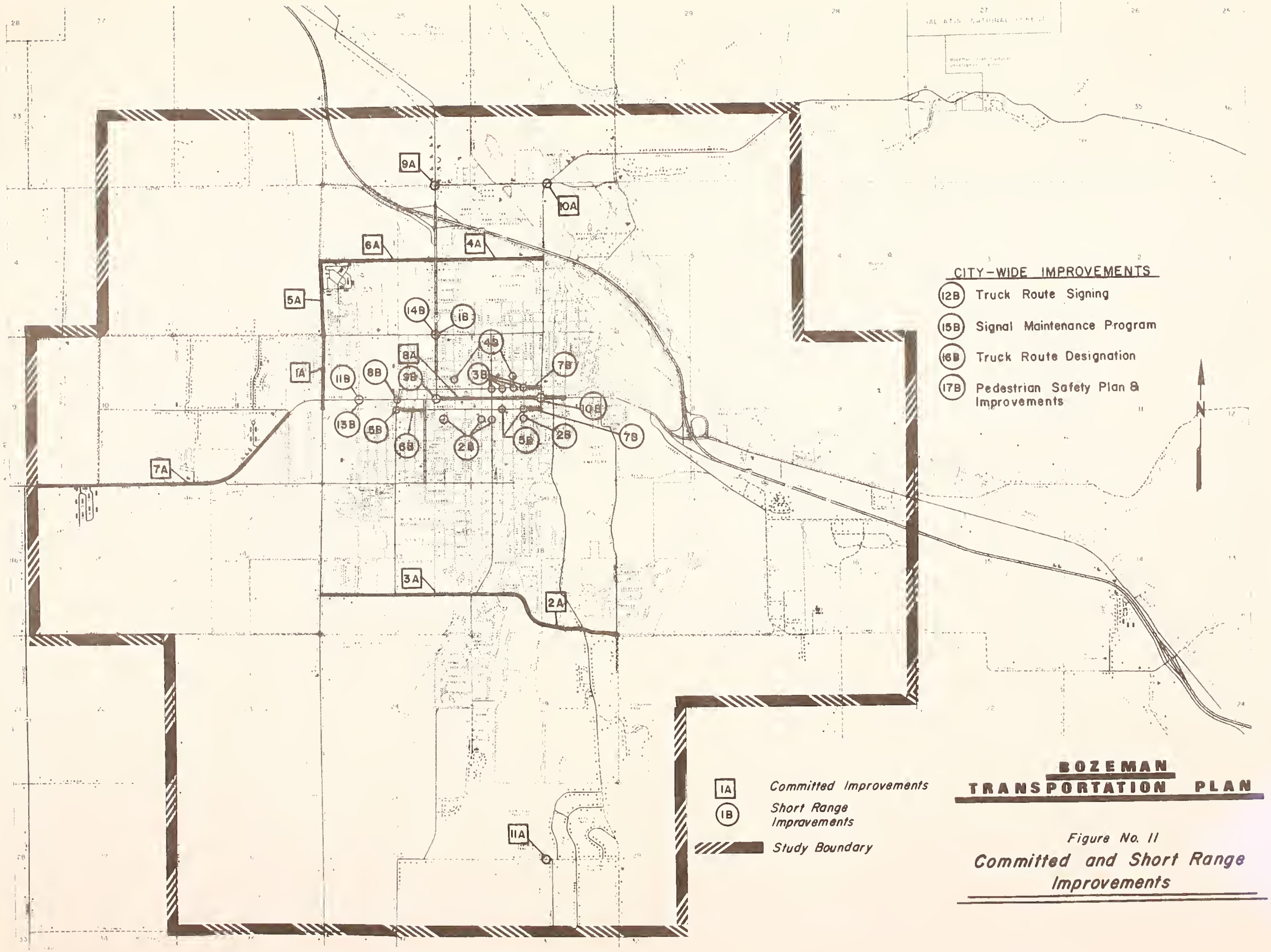
    0 - Either a positive impact due to fuel savings and no social or environmental negative impacts due to land acquisition or higher noise and CO levels, or the negative and positive impacts are offsetting.

    1 - Slight negative SEE impact due to minor widening or traffic increases in a commercial or relatively undeveloped area.

    2 - Moderate negative SEE impact due to widening in a developed residential area and moderate traffic increases.

    3 - Severe negative SEE impact; for example, encroachment on park lands, or taking of new right-of-way through a developed area.

The locations of the projects are shown on Figures 11, 12 and 13.


9A
10A
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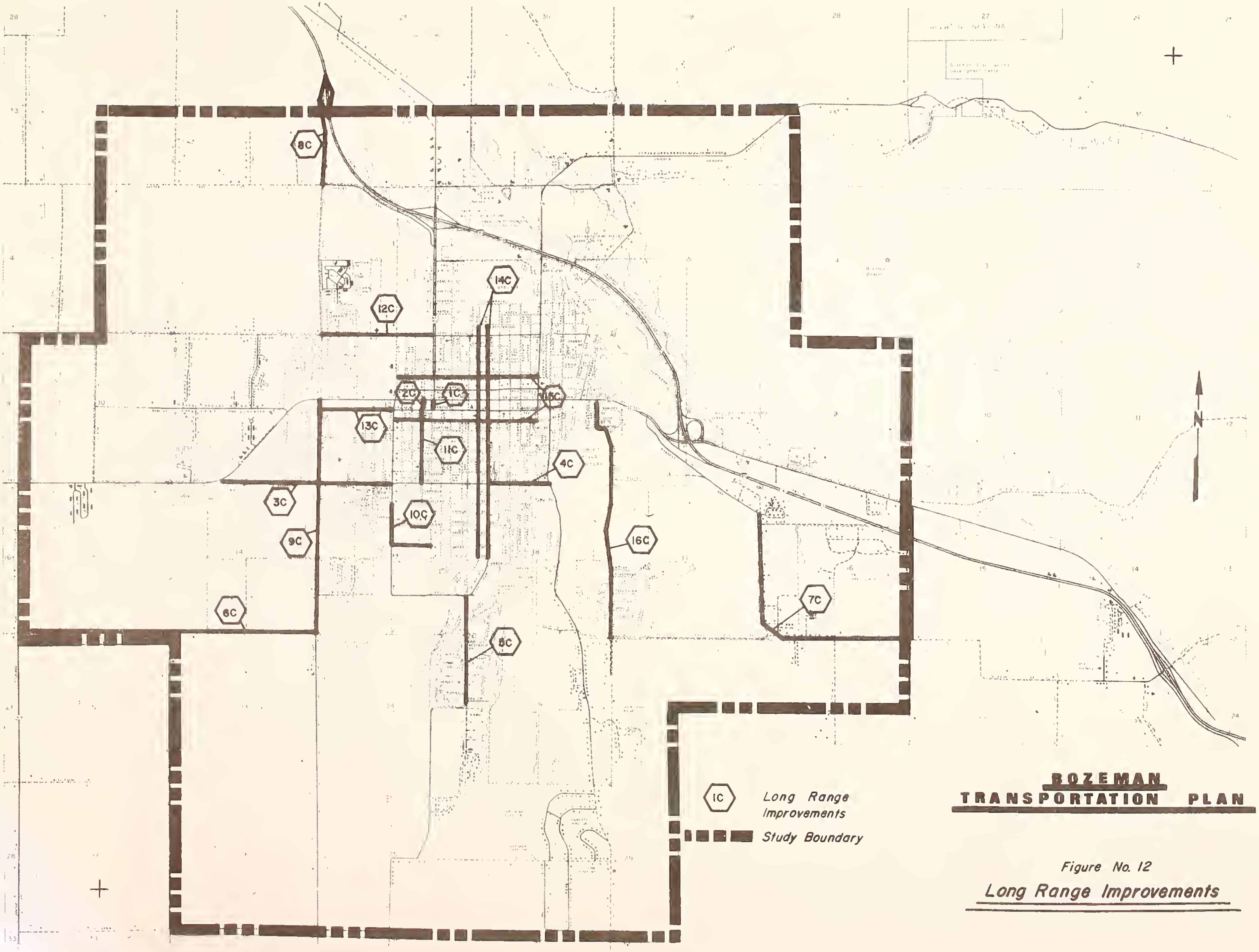
13B
5B
6B
2B
5B
2B
7B
7A
3A
2A
11A
CITY-WIDE IMPROVEMENTS
12B Truck Route Signing
15B Signal Maintenance Program
16B Truck Route Designation
17B Pedestrian Safety Plan & Improvements
N
1A Committed Improvements
1B Short Range Improvements
Study Boundary

BOZEMAN TRANSPORTATION PLAN

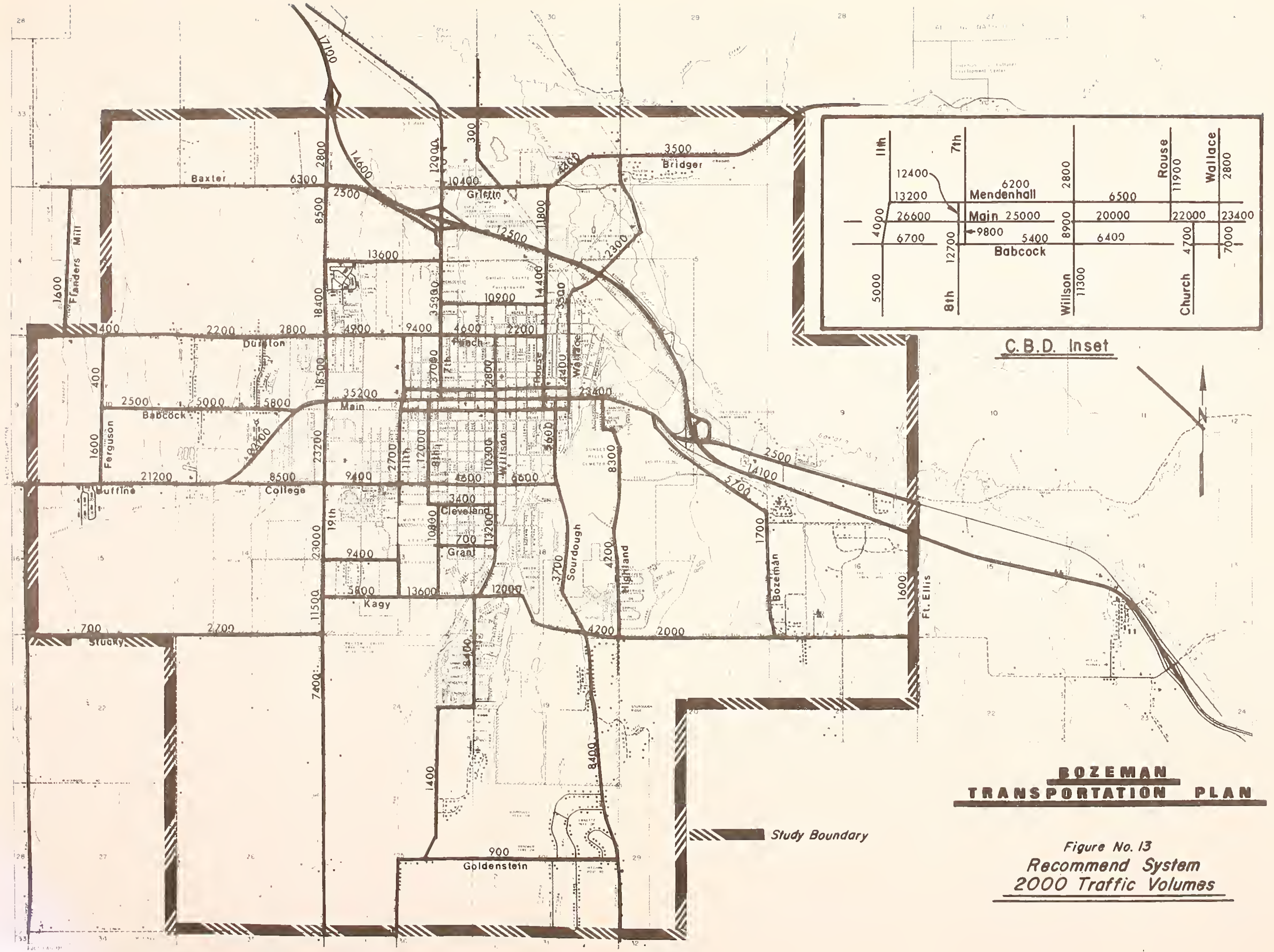
Figure No. 11
Committed and Short Range Improvements



BOZEMAN TRANSPORTATION PLAN

Figure No. 12

Long Range Improvements



BOZEMAN TRANSPORTATION PLAN

Figure No. 13
Recommend System
2000 Traffic Volumes

TABLE 11

PROJECT SUMMARY

NO.	LOCATION COMMITTED AND PLANNED IMPROVEMENTS	COST	COST/VMT PER DAY	SYSTEM IMPACT	SEE IMPACT
1A	19th Ave. - Babcock to Durston	$ 1,156,000	$ 125	2	1
2A	Kagy Blvd. - Highland to Willson	2,480,000	171	2	2
3A	Kagy Blvd. - Willson to 19th	2,280,000	132	2	2
4A	Oak St. - Rouse to 7th	1,473,000	169	1	2
5A	19th Ave. - Durston to Oak	1,245,000	135	1	2
6A	Oak St. - 19th to 7th	1,633,300	150	1	3
7A	U.S. 191 - 9 Mi West	5,823,000	129	1	1
8A	Main St. - 7th to Wallace	265,000	-	2	0
9A	7th and Griffin	213,416	-	2	0
10A	Bridger and Griffin	642,000	-	1	0
11A	Goldenstein Lane	286,133	-	1	0
	TOTAL	$ 17,496,849			
	SHORT - RANGE IMPROVEMENTS				
1B	7th and Durston - Turn Lane	2,250	-	2	0
2B	Olive St. - Pkg. Removal	3,200	-	1	0
3B	Mendenhall - Pkg. Removal	1,600	-	1	0
4B	Lamme - Pkg. Removal	1,600	-	1	0
5B	Babcock - Pkg. Removal	1,600	-	1	0
6B	Babcock - 8th to 11th	3,900	-	2	1
7B	Babcock and Mendenhall, Rouse to Wallace	5,200	-	2	1
8B	11th and Main - Turn Lane	2,250	-	2	0
9B	7th and Main - Turn Lane	2,250	-	2	0
10B	Rouse and Main - Turn Lane	2,250	-	2	0
11B	15th and Main - Turn Lane	2,250	-	2	0
12B	Truck Rt. Signing	1,000	-	1	0
13B	15th and Main - Access	1,000	-	2	1
14B	7th and Durston - Turn Lane	1,000	-	3	0
15B	Signal Maintenance	6,000	-	3	0
16B	Truck Route Study	15,000	-	1	0
17B	Pedestrian Safety	10,000	-	1	0
	TOTAL	$ 62,350			
	LONG-RANGE IMPROVEMENTS				
1C	7th Ave. - Main to Babcock	606,000	228	3	3
2C	8th Ave. - Mendenhall to Main	330,000	124	3	3
3C	College - Main to 11th	520,000	40	1	2
4C	College - Willson to Church	261,000	95	1	2
5C	So. 3rd - Kagy to Graf	880,000	142	1	2
6C	Stuckey Rd. - 19th to Cottonwood	240,000	45	1	2
7C	Bozeman Tr. and Ft. Ellis Rd	426,000	648	1	1
8C	19th - Oak to I-90	2,900,000	277	2	2
9C	19th - Stuckey to Main	2,490,000	67	2	2
10C	11th and Grant - Closure	10,000	-	0	2
11C	8th - Main to Cleveland	720,000	189	2	0
12C	Durston - 19th to 7th	800,000	112	2	2
13C	Babcock - 11th to 19th	720,000	-	1	1
14C	Willson and Grand Couplet	44,300	-	1	2
15C	Olive and Lamme Couplet	32,400	-	1	2
16C	Highland Blvd - Kagy to Main	1,500,000	-	1	2
	TOTAL	$ 12,479,700			

B. PROPOSED FUNDING SCENARIOS:

The Technical Advisory Committee reviewed the recommended improvements shown in Table 11, and related them to available funding. It was decided to develop two funding scenarios and to establish priorities for each scenario. In addition, several of the projects were scheduled for stage construction, reducing the initial outlay of funds by building a facility which would meet existing or short-term needs, and expanding the facility as future demands require.

Funding scenario number one is based on the current urban funding level and estimated funds, as provided by the Montana Department of Highways.

Funding scenario number two is based on current and estimated urban funding levels, plus an additional $450,000 per year to be provided by local funding sources.

TABLE 12

BOZEMAN TECHNICAL ADVISORY COMMITTEE
Recommended Project Priority List for Urban Funded Projects

July 20, 1982

SCENARIO NUMBER ONE

Project Priority	Project Description	Estimated Cost	Fund Balance	Fiscal Year Programmed
1.	Kagy Boulevard-Highland to Willson (divided 2-lane construction)	$2,480,000	($ 622,000)	1983
*1A.	Short Range or TSM Projects (To be funded at 5% of the yearly urban fund allocation once a positive balance has been achieved after letting priority #1)	(approximately $11,000 per year) $62,350 currently scheduled/transportation plan	$ 107,000	1986
2.	19th Avenue-Durston to Oak Street, Oak-19th to 7th (2 lane construction with R/W purchase for 4 lane)	$1,405,000	($ 21,000)	1991
**3.	Kagy Boulevard - 11th to 19th (2 lane construction with R/W purchase for 4 lane)	$ 673,000	($ 28,000)	1995
4.	Projects to be constructed as need arises			1995-2000
	Improve Durston Road	$ 800,000		
	Construct 7th to Rouse Cooridor	$ 750,000		
(1983-2000)	TOTAL COSTS AND FUNDS	$6,170,350	$5,706,000	

* Some of these short-range projects may be funded by local government.

** It is recommended that an agreement be worked out with MSU and other interested parties to expedite construction of this project by sharing of the total cost.

TABLE 12

BOZEMAN TECHNICAL ADVISORY COMMITTEE
Recommended Project Priority List
Urban Funds Plus $450,000 Per year Local Funds
July 20, 1982
SCENARIO NUMBER TWO

Project Priority	Project Description	Estimated Cost	Fund Balance	Fiscal Year Programmed
1.	Kagy Boulevard-Highland to Willson (divided 2-lane construction)	$2,480,000	($ 172,000)	1983
*1A.	Short Range or TSM Projects (To be funded at 5% of the yearly urban fund allocation once a positive balance has been achieved after letting priority #1)	(approximately $11,000 per year) $62,350 currently scheduled/transportation plan	$ 526,000	1984
2.	19th Avenue-Durston to Oak Street, Oak-19th to 7th (2 lane construction with R/W purchase for 4 lane)	$1,405,000	$ 480,000	1986
**3.	Kagy Boulevard - 11th to 19th (2 lane construction with R/W purchase for 4 lane)	$ 673,000	$ 468,000	1987
4.	Construct 7th to Rouse Corridor	$ 750,000	$ 379,000	1988
5.	Improve Durston - 7th to 19th	$ 800,000	$ 240,000	1989
6.	College - Willson to Church	$ 261,000	$ 651,000	1990
7.	College - Main (US 191) to 11th	$ 520,000	$ 131,000	1990
8.	Projects to be Constructed as Need Arises			
	-South 3rd - Kagy to Graf (reconstruction)	$ 880,000		1990-
	-Highland-Kagy to Main (reconstruction)	$ 1,500,000		2000
	-19th - Oak to Baxter Lane (new construction)	$ 1,300,000		
	-19th - Stucky to Main (reconstruction)	$ 2,490,000		
	-Kagy - Willson to 19th (add 2 lanes)	$ 1,800,000		
	-19th and Oak (add 2 lanes)	$ 1,000,000		
	TOTAL OF YEAR 1990-2000 Projects	$ 8,970,000		
	Funds Available - 1990-2000		$ 6,851,000	
	(1983-2000) TOTAL COSTS AND FUNDS	$15,921,350	$13,806,000	

* Some of these short-range projects may be funded by local government.

** It is recommended that an agreement be worked out with MSU and other interested parties to expedite construction of this project by sharing of the total cost.

APPENDIX A

STANDARD ROADWAY CAPACITIES

APPENDIX A

STANDARD ROADWAY CAPACITIES

	Vehicle/Hour Green[a]	24-Hour Capacity[a]
Freeway		
Four lane urban section	4,600-5,000	38,000-42,000
Primary Arterial		
Six lanes divided, no parking	4,100-5,200	20,000-26,000
Four lanes divided with parking	2,900-3,500	14,800-18,000
Four lanes divided, no parking	3,000-3,700	15,000-19,000
Four lanes, turn lane, no parking	2,500-3,200	13,000-16,000
Four lanes with parking	2,200-2,800	11,000-14,000
Secondary Arterial		
Four lanes divided, no parking	2,700-3,300	12,000-15,000
Four lanes, turn lane, no parking	2,500-3,200	12,000-15,000
Four lanes, parking one side	2,400-3,000	11,000-14,000
Four lanes, no parking	2,400-3,000	11,000-14,000
Two lanes with parking	1,800-2,200	8,000-10,000
Collector Street		
Four lanes, no parking	2,400-2,900	7,000- 9,000
Two lanes with parking	1,600-2,000	5,000- 6,000
Two lanes with parking, residential	1,300-1,800	4,000- 5,000

[a] The capacities are based on the following: PHF= .80; LF = 0.3; peak hour = .12 AWD; left turns, 10 percent; right turns, 10 percent, comm. vehicles, 5 percent; local transit - none; green time, primary arterial 50 percent; secondary arterial, 55 percent; collector street, 35 percent; directional split 55-45 percent.

Source: Highway Capacity Manual

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